1/18/2024

Elizabeth M. Brannon, Ph.D.

Contact information

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Personal Data

Date of Birth January, 16, 1971
Place of Birth Ann Arbor, MI

Education

Ph.D., Columbia University, Psychology, 2000
Advisor, Dr. Herbert S. Terrace
Ph.D. awarded with distinction

M.A., Columbia University, Biological Anthropology, 1994
Advisor, Dr. Marina Cords

B.A., University of Pennsylvania, Biological Anthropology, 1992
Thesis advisor, Dr. Dorothy Cheney
summa cum laude with distinction in the major
Elected to Phi Beta Kappa 1993

Positions Held

Edmund J. and Louise W. Kahn Term Chair, The University of Pennsylvania 2016-
Professor, Department of Psychology, The University of Pennsylvania 2015-
Professor, Center for Cognitive Neuroscience & Department of Psychology and Neuroscience, Duke University, 2012- 2015
Associate Professor, Center for Cognitive Neuroscience & Department of Psychology and Neuroscience, Duke University, 2008-2011
Associate Professor, Evolutionary Anthropology, Duke University, 2008-2015 (Secondary Appointment)
Adjunct Assistant Professor, Department of Psychology, University of North Carolina, Chapel Hill. 2002-2015 (Secondary Appointment)
Assistant Professor, Center for Cognitive Neuroscience & Department of Psychology and Neuroscience, Duke University, 2001-2008
Assistant Research Professor, Center for Cognitive Neuroscience & Department of Psychology: Experimental, Duke University, 2000-2001

Honors and Awards

Edmund J. and Louise W. Kahn Term Chair awarded 2016, 2021
Elected Fellow of American Psychological Society, 2020
James McDonnell Scholar Award, 2008-2015

Early Investigator Award, Society for Experimental Psychology (SEP), 2008
Thomas Langford Lectureship Award, Duke University, 2008
NSF CAREER Award (2005-2010)
John Merck Scholar (2003-2007)
Ph.D. awarded with distinction, 2000
Presidential Teaching Award, Columbia University, 1997
Predoctoral National Research Service Award, NIMH, 1998-2000
National Science Foundation Graduate Fellowship, 1993-1996
University Scholar of the University of Pennsylvania, 1989-1992
University Scholar Research Grant, University of Pennsylvania, 1992

Research Grants and Fellowships

Pending

2024-2029 NICHD HD113637-01A1
Decomposing economic and numerical decisions: A developmental computational approach
Co-PIs Brannon, E.M. Platt, M.L

Completed funding

2018-2023 NSF proposal "Harnessing numerical intuition to improve math performance"
Division of Research on Learning, # 1660973 $1,446,036.00
No cost extension 2021-2023

2014-2020 RO1 HD079106-01
"Improving Math Ability via Primitive Number Sense Training"
Elizabeth M. Brannon (PI)
The main goals of this research proposal are to explore the cognitive and neural relationship between approximate arithmetic and symbolic arithmetic in adults and children using training paradigms and fMRI.

2010-2016 National Science Foundation Research Grant, 0951690
"*Relationship between early and later developing numerical abilities*"
Elizabeth M. Brannon (PI). $699,966

2008-2016 James S. McDonnell Foundation Scholar Award.
Elizabeth M. Brannon (PI). $600,000

2013-2015 National Center for Responsible Gaming,
Scott Huettel (PI), Brannon Co-PI

2013-2014 BASS teaching team, Duke, Brannon and Hahn $16,800
Math before Symbols: Games to Increase School Readiness in Pre-Schoolers: This team will work with pre-school and early elementary school children to test the effectiveness of an iPad-based game in readying children's math skills, and a subset of the team might aim to produce a pre-K children's book based on these insights about how children learn math before symbols.

2013-2014 Initiative on Education and Human Development, Duke, $25,000

2010-2012 RO1 HD059108-06A2 (1 year RO1 renewal & no cost extension)
"Representation of number in infancy"
Elizabeth M. Brannon (PI). $289,500

2008-2013 NICHD RO1HD057173-01

	"Functional and neuroimaging of the development of neural mechanisms for number processing"
	Kevin Pelphrey (PI), EMB (Co-PI)
2009-2013	NEI 1R01EY01
	"*Contributions of Areas LIP and VIP to Numerical Behavior*"
	Michael L Platt (PI), EMB (Co-I)
2010-2011	NICHD RO1 HD-049912-05S1 (ARRA supplement)
	"Representation of number in primates"
	Elizabeth M. Brannon (PI). $59,661
2005-2011	NICHD RO1HD049912-01A2
	"Representation of number in primates"
	Elizabeth M. Brannon (PI) $969,871
2005-2011	NSF CAREER award
	"CAREER: Evolution and development of numeracy"
	Elizabeth M. Brannon (PI). $400,000
2009-2011	NIH1RC1 MH088680-01
	"*From Phenotype to Mechanism: Mapping the Pathways Underlying Risky Choice*"
	Scott Huettel (PI), EMB (Co-I)
2010-2011	NSF workshop conference award
	"Space, Time and Number: The Cerebral Basis of Mathematical Intuitions"
	Elizabeth M. Brannon (PI). Direct $32,717
2010-2011	NICHD R13 workshop conference award
	"Space, Time and Number: The Cerebral Basis of Mathematical Intuitions"
	Elizabeth M. Brannon (PI). Direct $9,000
2003-2008	NIMH RO1MH066154-01
	"Representation of number in infancy"
	Elizabeth M. Brannon (PI). Direct $600,000
2003-2007	John MERCK Scholars Fellowship,
	"The evolution and ontogeny of mathematical abilities human infants represent number."
	Elizabeth M. Brannon (PI). Direct $150,000
2002-2006	NSF ROLE and Developmental and Learning Sciences
	"The Representation of Number in Infancy"
	Elizabeth M. Brannon (PI).
2001-2003	RO3 MH64955-01
	"Electrophysiological correlates of numerical discrimination in human infants"
	Elizabeth M. Brannon (PI), G.R. Mangun (Co-PI)
2001-2002	B/START MH63075-01 NIMH
	"Knowledge of numerical relationships in infants"
	Elizabeth M. Brannon (PI)
2000	Arts and Science Research Council, Duke University

External Service & Professional Experience

2024	Cognitive Science Society review committee
2016-	Development and Learning Sciences NSF advisory panel
2018-	Board of consulting editors, *Learning & Behavior*
2004-	Editorial Board *Cognition*

2010- Associate Editor *Frontiers in Comparative Psychology*
2010-2018 Editorial Board *Frontiers in Developmental Psychology*
2015-2020 Associate Editor, *Open Mind*
2015-2019 Governing Board of The Mathematical Cognition and Learning Society (MCLS)
2011-2015 Associate Editor, *Developmental Science*
2010-2014 Regular Panel member NIH Cognition and Perception Study Section
2010-2015 Executive committee member for The International Society for the Study of Attention & Performance
2010-2015 Treasurer of The International Society for the Study of Attention & Performance
2009-2012 Advisory board *Current Directions in Psychological Science*
2009-2013 Editorial Board *Journal of Experimental Psychology: Animal Behavior Processes*
2008-2010 Editorial Board *Infancy*
2003-2010 Editorial Board *Psychological Science*

Conferences and Symposia Organized

2014 Beyond Academia: workshop for graduate students considering career paths outside of academia, October, 30th, 2014
2010 International Attention and Performance meeting in Paris, France, on Space Time and Number: Co-organizer with Dr. Stanislas Dehaene
2007 National Science Foundation Workshop on Neuroscience and Mathematics
Co-Chair with Dr. John Anderson
2009 Comparative Cognition Society Symposium in honor of Dr. Herb Terrace 2009

Invited Symposia talks and Colloquia

2024 Invited SQUAB, Philadelphia, PA May 2024

2023

Invited BF Skinner Lecture, Association for Behavior Analysis International, Denver Colorado, May 2023
November 2023 Max Planck seminar

2022

Colloquium, Iowa, October 2022
NSF conference, Indiana, May 2022
Colloquium, Center for Mind/Brain Sciences University of Trento, March 3, 2022,

2020

- Wharton-QS Reimagine Education Conference, panel on Educational Neuroscience, November 2020

2019

- Harvard, Center for Brain Science, April 9th, 2019
- NYU, Department of Psychology Cognition and Perception lunch, April 4, 2019
- Yale, Current works in cognitive science, February 26, 2019
- Dartmouth, Cognitive Science Program, January 23, 2019

2018

- Wharton-QS Reimagine Education Conference, panel on the neuroscience of learning and its implications in designing effective curricula, November 2018
- Keynote Speaker 7th Consumer Neuroscience Satellite Symposium, Wharton School, University of Pennsylvania, October, 4, 2018
- Math Cognition and Learning Society invited symposium, Chair Rafael Nunez
  Debate: Is there an evolved capacity for number?
- Faculty speaker for psychology graduation
- Jean Piaget Conference entitled "The origins of number" Geneva, Switzerland.

2017

- Discussant, Cognitive Development Society, Symposium on proportional reasoning, Portland, Oregon
- Colloquium**,** Center for Neural Basis of Cognition (CNBC)
  University of Pittsburgh, October 2, 2017
- Invited speaker, Bernstein Conference on Computational Neuroscience, Gottingen, Germany, 9-13-2017
- Invited speaker, OSU/Maribor/Rijeka Philosophy Conference in Dubrovnik, Croatia in June, 2017.
- Colloquium, University of Descartes, Paris, May 15
- Hyatt lecture, Saint Joseph's University, March, 7, 2017
- The origins of numerical abilities, The Royal Society, London February 20-22/2017

2016

- Invited talk in Symposium for 50th anniversary of The Duke Lemur Center, October, 2016
- Lecture at Annual meeting of Concepts, Actions, and Objects: Functional and Neural Perspectives, Center for Mind/Brain Sciences, Rovereto, Italy, May 6-9, 2016.
- Distinguished Lecturer in the Social, Behavioral, and Economic Sciences (SBE) Directorate, National Science Foundation, 3-9-2016
- Psychology Colloquium, Villanova, 2-5-2016

2015

- 5th Latin American School for Educational Neuroscience March, 2015 in Chile
- Society for Research in Child Development, Philadelphia, Symposium
- Rutgers, New Brunswick, Fetzschrift for C.R. Gallistel & Rochel Gelman, April, 2015

2014

- Invited Speaker Emory University, NSF funded workshop on learning, March 2014
- Colloquium, University of Pennsylvania, May, 2014
- Origins of Intelligence workshop, Sapporo Japan, July 2014
- Special invited lecture Japanese Animal behavior meeting, Inuyama, Japan, July 2014
- Colloquium, Keio University, Tokyo, Japan, July 2014
- MIT invited colloquium, October, 2014, Department of Brain and Cognitive Sciences
- Rethinking the innateness hypothesis, Rutgers, October 2014
- Invited Speaker, Society for Language Development, Boston, November 2014

2013

- University Scholar Seminar, Duke, November 22nd
- Morris Symposium: Quantification and Number, Stony Brook September 2013
- Colloquium, INSERM, Paris June 2013
- Colloquium, Lisbon Champalimaud Neuroscience Programme, July 10th
- Cognitive Science Colloquium, University of Maryland, May 2nd
- NIH conference on Math Cognition Conference, May 20th-21st
- Keynote speaker for Femmes, Middle school girls' science day, Durham NC

2012

- 2nd Latin American School for Education, Cognitive and Neural Sciences to be held during March 5-16, 2012 in Patagonia, Argentina
- Psychology colloquium, Washington University, March 26th
- Psychology colloquium, Princeton University, September 21st

2011

- Developmental Brownbag, UNC, Chapel Hill
- Workshop on Evolution of Human Cognition, Georgetown University
- Psychology Department Colloquium, Harvard University
- Ben Gurion University, Israel April 2011, declined
- National Institute for Child Development Math Consortium Meeting, May 16-17, 2011
- Second Annual Aspen Brain Forum titled, "Cognitive Neuroscience of Learning with Implications for Education**,**" New York Academy of Sciences and the Aspen Brain Forum Foundation, Aspen, Colorado September 22-24, 2011
- Cognitive Neuroscience Colloquium, University of Pennsylvania, November, 2011

2010

- Invited presidential colloquium, International Conference on Infant Studies (ICIS) March 2010
- Duke Institute for Brain Sciences, Workshop on Development, Spring 2010
- Conference on Space, Time, and Number, Paris, 2010
- American Scientist Pizza Lunch, September 21st, 2010
- Developmental BrownBag UNCG, Dec 3rd 2010

2009

- American Academy of Advancement of Science, Invited Symposium on *Comparative Cognition: The Science of Mental Evolution*
- Comparative Cognition Society, Organizer of symposium to honor H.S. Terrace
- Invited colloquia at University of British Columbia, interdisciplinary speaker series, Arts and Science, Neuroscience, & Med School

2008

- Society for Experimental Psychology: Young Investigator Award Speaker
- Invited symposium speaker, International Primatological Society, Edinburgh

2007

- Symposium on Brain Mechanisms of Sequential Behavior, Society for Neuroscience, The neural and behavioral underpinnings of numerical ordering San Diego CA, October 2007
- Cognitive Neuroscience Society symposium: Numerical Understanding in the Brain: Comparative, Developmental, and Neural Perspectives, New York May 2007
- National Science Foundation conference on Neuroscience and Learning, invited speaker, May 2007
- Invited Colloquium, Institute for Research in Cognitive Science, University of Pennsylvania, March 2007

2006

- National Institutes of Health Behavioral and Social Science Research Lecture Series, Nov 20, 2006
- American Psychological Association, invited symposium, August 10-13, 2006, in New Orleans
- Invited meeting Konrad Lorenz Institute for Evolution and Cognition Research (KLI), The New Cognitive Sciences, June 2006 Vienna; Organizers Lynn Nadel & Mary Peterson
- Invited colloquium, Department of Psychology, Stanford, April 2006
- Invited colloquium, Department of Psychology, Northwestern, March 2006
- Invited Developmental Brown Bag, Department of Psychology, University of Chicago, March 2006

2005

- Invited colloquium, Department of Psychology, Columbia, December 2005
- Invited Presidential Symposium Cognitive Development Society October 2005
- Invited symposia Yale conference on objects and infancy, May 2005
- Invited colloquium, Department of Psychology, Yale, March 2005
- Invited address, Southern Society for Philosophy and Psychology, March 2005

2003-2004

- Cognitive Neuroscience Summer Institute, Dartmouth NH June 2004
- Invited colloquium, Department of Psychology, Georgia State University, Fall 2003.
- Invited meeting Fyssen Foundation, "From monkey to human brain" Paris, France June 2003
- Presidential symposium Eastern Psychological Association, 2003, "Numerical thinking: A comparative study"
- Invited meeting, OECD. Brockton, MA. January 2003

2001-2002

- Invited Developmental Brown Bag, Department of Psychology, University of Virginia, November 2002.
- Invited Developmental Brown Bag, Social and Health Sciences Dept., Duke University, September, 2002.
- Invited Colloquium Max Planck, Leipzig, May 2002.
- Invited Colloquium Max Planck, Tuebingen, May 2002.
- Invited Colloquium, Center for Cognitive Science, Rutgers University, December 2001.

- Job talk, Department of Psychology, University of North Carolina, Chapel Hill April, 2001
- Invited BEAST, Department of Anthropology, Duke University, April 2001.

2000

- Department of Neurobiology, Faculty guest speaker at weekend retreat, Duke University Medical Center, October 2000.
- Cortex Club, Department of Neurobiology, Duke University Medical Center, Fall 2000
- Commentator for Exploring the Mind Symposium, Duke University, February 2000.
- Invited colloquium, Nathan Kline Institute, NYC, February, 2000.

1997-1999

- Dissertation seminar, "Ordinal numerical abilities in rhesus monkeys," Department of Psychology, Columbia University, 1999.
- St. Ann's High School, Brooklyn, NY, "Science and education," Fall 1999
- Lunch-box seminar (job talk); Department of Psychology, Duke University, January, 1999.
- Department of Psychology, Columbia University, "Chunking in humans and animals" 1998.
- Department of Psychology, University of Pennsylvania, "Ordinal numerical knowledge in rhesus monkeys," April, 1997.

Publications

Google Scholar H index – 70
18643 **citations**
[u]designates undergraduate collaborators

Books & Special issues:

1. **Brannon, E.M.** (Ed.) 2010. Thought without language: A tribute to the contributions of H.S. Terrace. *Behavioral Processes*, *82*(2), 137-138.
2. Dehaene, S., & **Brannon, E.M.** (Ed.s) Space, Time, and Number in the Brain: searching for the foundations of mathematical thought. Elsevier, 2011.
3. Dehaene, S., & **Brannon, E.M.** 2010. Space, time, and number: A Kantian research program. *Trends in Cognitive Sciences*, *14*(12), 517-519.
4. Purves, D., **Brannon, E.,** Cabeza, R., Huettel, S., LaBar, K., Platt, M., Woldorff, M. (2007). Principles of Cognitive Neuroscience. Sunderland, Massachusetts: Sinauer Associates.

Reviews and Commentaries:

1. Szkudlarek, E., & **Brannon, E. M.** (2017). Does the approximate number system serve as a foundation for symbolic mathematics? *Language Learning and Development*, *13*(2), 171-190.
2. Park, J., DeWind, N.K. and **Brannon, E.M.** "Direct and rapid encoding of numerosity in the visual stream." *Behavioral and Brain Sciences* 40 (2017).
3. Bugden, S., DeWind, N. K., & **Brannon, E. M.** (2016). Using cognitive training studies to unravel the mechanisms by which the approximate number system supports symbolic math ability. *Current Opinion in Behavioral Sciences*, *10*, 73-80. PMCID: PMC5399542
4. Park, J., **Brannon, E.M.,** (2016). How to interpret cognitive training studies: A reply to Lindskog & Winman, *Cognition,* 131 (2016): 92-107. PMID: 26972469
5. Drucker, C.B., & **Brannon, E. M.** (2015). Commentary on: "Number-space mapping in the newborn chick resembles humans' mental number line", *Frontiers in Psychology,* 6:352. DOI:

10.3389/fpsyg.2015.00352

6. **Brannon, E.M.,** & Park, J. (2015). Navigator Chapter for: Phylogeny and Ontogeny of Mathematical and Numerical understanding, In Handbook on Mathematical Cognition, Ed.s R.Cohen-Kadosh
7. Starr, A., & **Brannon, E. M.** (2015). Evolutionary and Developmental Continuities in Numerical Cognition, Chapter In Ed.s Geary, D, Berch, K. Mann-Koepke, Academic Press: London.
8. Merritt, D., DeWind, N., & **Brannon, E.M.** (2012). Comparative cognition of number representation, In Handbook of Comparative Cognition. Editors, T. Zentall and E. Wasserman. Oxford: Oxford University Press.
9. Roitman, J.D., **Brannon, E.M., &** Platt, M.L. (2012). Representation of numerosity in posterior parietal cortex. *Frontiers in Integrative Neuroscience*, *6*(25). PMCID: PMC3364489.
10. **Brannon, E.M., &** Merritt, D. (2011). Evolutionary foundations of the Approximate Number System. In Space, Time, and Number in the Brain: Searching for the Foundations of Mathematical Thought. Dehaene, S., & Brannon, E.M. (Eds.). New York, NY: Elsevier.
11. Cantlon, J. F., & **Brannon, E. M.** (2011). Animal Arithmetic. Encyclopedia of Animal Behavior. Editors, Breed, M.D., & Moore, J. Oxford: Elsevier.
12. **Brannon, E**.M., Jordan, K.E., & Jones, S. (2010). Behavioral Signatures of Numerical Discrimination. Primate Neuroethology. Platt, M.L., & Ghazanfar, A. (Eds.). Oxford: Oxford University Press.
13. Dehaene, S., & **Brannon, E.M.** (2010). Space, Time, and Number: A Kantian Research Program. Special Issue on Space, Time, and Number, *Trends in Cognitive Sciences*, *14*(12), 517-519. DOI: 10.1016/j.tics.2010.09.009.
14. **Brannon, E.M.** (2010). Introduction to Thought without language: A tribute to the contributions of H.S. Terrace. *Behavioral Processes*, *82*(2), 137-138.
15. Cantlon, J.F., Platt, M.L., & **Brannon, E.M.** (2009). Beyond the number domain. Invited review. *Trends in Cognitive Sciences*, *13*(2), 83-91. PMCID: PMC2709421.
16. Jordan, K.E., & **Brannon, E.M.** (2009). A comparative approach to understanding human numerical cognition. The Origins of Object Knowledge. Hood, B., & Santos, L. (Eds.). Oxford: Oxford University Press.
17. Libertus, M.E., & **Brannon, E.M**. (2009) Behavioral and neural basis of number sense in infancy, *Current Directions in Psychological Science*, *18*(6), 346-351. PMCID: PMC2857350.
18. **Brannon, E.M,** & Cantlon, J. F. (2009). A comparative perspective on the origin of numerical thinking. In Cognitive Biology: Evolutionary and Developmental Perspectives on Mind, Brain, and Behavior. Luca Tomasi, Mary A. Peterson, and Lynn Nadel (Eds.). Cambridge: MIT Press.
19. Cantlon, J. F., Cordes, S., Libertus, M. E., & **Brannon, E. M.** (2009). Numerical abstraction: It ain't broke. (commentary). *Behavioral and Brain Sciences*, *32*(3-4), 331-332.
20. Cantlon, J.F., Cordes, S., Libertus, M.E., **Brannon, E.M.** (2009) Comment on "Log or Linear? Distinct Intuitions of the Number Scale in Western and Amazonian Indigene Cultures, *Science*, *323*(5910), 38. PMCID: PMC3393850.
21. Cordes, S., & **Brannon, E. M.** (2008). Quantitative competencies in infancy. Invited Annual Review, *Developmental Science, 11*(6), 803-808. DOI: 10.1111/j.1467-7687.2008.00770.x.
22. **Brannon, E.M.** (2006). The representation of numerical magnitude. Invited review for *Current Opinion in Neurobiology, 16*(2), 222-229. PMCID: PMC1626588.
23. **Brannon, E.M.,** & Terrace, H.S. (2002). The Evolution and Ontogeny of Ordinal Numerical Ability. In Bekoff, M., Allen, C., and Burghardt, G.M. The Cognitive Animal. Cambridge, MA: The MIT Press. Pp. 197-204.

Full manuscripts in preparation:

1. DeWind, N.K., **Brannon, E. M.**, Platt, M.L. A population code for visual quantity in macaque ventral intraparietal area (VIP)
2. DeWind, N.K., Dayan[u], I.A. Woldorff, M.G. , **Brannon, E. M.** The numerosity code in the dorsal visual stream is automatic but sharpened by attention to number
3. Qu, C., Cai, W., Szkudlarek, E., **& Brannon, E.M**. Math anxiety impacts symbolic but not non-symbolic calculation accuracy.
4. Clarke, S., Qu, C., Luzzi, F., **& Brannon, E.M**. The magnitude of the connectdeness illusion increases with age.
5. Qu, C. & **Brannon, E.M.** Numerical ensembles
6. Yousif, S., & **Brannon, E.M.** Evidence of intuitive network topology in young children

Manuscripts under revision:

1. Qu, C., Clarke, S., & **Brannon, E.M.** Rational Number Representation by an Approximate Number System (Invited revision, *Cognition*)
2. Qu, C., & **Brannon, E.M.** Contextual coherence increases perceived numerosity independent of semantic content (Invited revision at *JEP: General*)
3. Sheng, F. Platt, M.L., Wang, R. Bugden, S. **Brannon, E.M.** Asynchronous Development of Loss Aversion, (*PNAS,* under invited revision)
4. Yousif, S., Clarke, S., & **Brannon, E.M.** Number adaptation: Fact or fiction? (Psych. Rev., under revision)
5. Yousif, S., & **Brannon, E.M.** Intuitive network topology, *JEP: General* (Invited second revision)

Published Peer Reviewed Papers:

1. Barack, D.L., Ludwig, V.U., Parodi, F. Ahmed, N., **Brannon, E.M.**, Ramakrishnan, R. Platt, M.L., Attention Deficits Linked with Proclivity to Explore while Foraging (accepted, Proceedings of the Royal Society B).
2. Rugani, R., Platt, M., Zhang, Y., & **Brannon, E**. Magnitude shifts spatial attention from left to right in rhesus monkeys as in the human mental number line, *iScience*
3. Pinhas, M., Paulsen, D. J., Woldorff, M. G., & **Brannon, E. M.** (2022). Neurophysiological signatures of approximate number system acuity in preschoolers. *Trends in Neuroscience and Education*, 100197.
4. Rugani, R., Zhang, Y., Ahmed, N., & Brannon, E. (2022). Children perform better on left than right targets in an ordinal task. *Acta Psychologica*, *226*, 103560.
5. Qu, C., DeWind, N. K., & Brannon, E. M. (2022). Increasing entropy reduces perceived numerosity throughout the lifespan. *Cognition*, *225*, 105096. PMCID: 35316670
6. Rugani, R., Platt, M., Chen, Z. & **Brannon, E.M.** (2022). Relative numerical middle in rhesus monkeys. 18: 20210426. *Biology Letters* PMCID: PMC8826140
7. Szkudlarek, E., DeWind, N.K., **Brannon, E.M.** (2022). Young children intuitively divide before they recognize the division symbol." *Frontiers in human neuroscience* (2022): 53.
8. Bugden, S., Mackey, A., **Brannon, E. M.**, (2021) Developmental specialization of left intraparietal sulcus for processing number words, *Developmental Cognitive Neuroscience,* 51, 101011
9. Park, J., Godbole, S., Woldorff, M. G., & **Brannon, E. M**. (2021). Context-Dependent

Modulation of Early Visual Cortical Responses to Numerical and Nonnumerical Magnitudes. *Journal of cognitive neuroscience*, *33*(12), 2536-2547. PMCID: 34407187

10. Qu, C., Szkudlarek, E., & **Brannon, E. M.** (2021). Approximate multiplication in young children prior to multiplication instruction. *Journal of experimental child psychology*, *207*, 105116.
11. Bugden, S., Szkudlarek, E., **Brannon, E. M.**, (2021) Approximate arithmetic training does not improve symbolic math in third and fourth grade children, *Trends in Educational Neuroscience,* 22, 100149
12. Szkudlarek, E., Park, J., & **Brannon, E. M**. (2020). Failure to replicate the benefit of approximate arithmetic training for symbolic arithmetic fluency in adults. *Cognition*, *207*, 104521 PMCID: PMC7805575
13. Rugani, R., Platt, M. L., Chen, Z., & **Brannon, E. M.** (2020). Middle identification for rhesus monkeys is influenced by number but not extent. *Scientific Reports*, *10*(1), 1-10
14. Tomlinson, R. C.*, DeWind, N. K., & **Brannon, E. M.** (2020) Number sense biases children's area judgments. *Cognition* 204: 104352.
15. Szkudlarek, E., **Brannon, E. M.**, (2021). First and second graders successfully reason about ratios with both dot arrays and Arabic numerals. *Child Development* 10.1111/cdev.13470 PMCID: 33609044
16. DeWind, N. K., Bonner, M. F., & **Brannon, E. M.** (2020). Similarly oriented objects appear more numerous. *Journal of Vision*, *20*(4), 4. https://doi.org/10.1167/jov.20.4.4 PMCID: 32271896
17. Bugden, S., Woldorff, M., **Brannon, E. M.**, (2019). Shared and distinct neural circuitry for approximate and symbolic double-digit addition, *Human Brain Mapping* 40.4 (2019): 1328-1343. **PMCID:** PMC C685694
18. DeWind, N.K., Park, J., Woldorff, M. & **Brannon, E. M.**, (2019). Numerical encoding in early visual *Cortex* 114 (2019): 76-89.
19. Starr, A., Roberts[u], R., **Brannon, E. M.**, (2018). The acuity and manipulability of the ANS have separable influences on preschoolers' symbolic math achievement, *Frontiers in Psychology* Front. Psychol., 11 December 2018 | https://doi.org/10.3389/fpsyg.2018.02554
20. Szkudlarek, E., & Brannon, E. M. (2018). Approximate Arithmetic Training Improves Informal Math Performance in Low Achieving Preschoolers. *Frontiers in Psychology*, *9*, 606. PMCID: 29867624
21. DeWind, N.K., Peng, J., Luo[u] A. E. **Brannon, E. M.**, Platt, M.L. (2018). Evidence from pharmacological inactivation does not support a unique role for the intraparietal sulcus in approximate enumeration in macaque monkeys, PloS one 12 (12), e0188820
22. Starr, A., DeWind, N. & **Brannon, E. M.** (2017) The contributions of numerical acuity and non-numerical stimulus features to the development of the number sense and symbolic math achievement, *Cognition*, 168:22-233.
23. Fornaciai, M., **Brannon, E.M.,** Woldorff, M.G. Park, J. (2017). Numerosity processing in early visual cortex, in press, *Neuroimage* 157(15): 429-438.
24. Park, J., Berg, B., Chiang, C.[u], Woldorff, M. G., & **Brannon, E. M.** (2017). Developmental trajectory of neural specialization for letter and number visual processing. *Developmental Science*. 21.3 (2018): e12578
25. Li, R., Roberts, R. C., Huettel, S. A., & **Brannon, E. M.** (2017). Five-year-olds do not show ambiguity aversion in a risk and ambiguity task with physical objects. *Journal of experimental child psychology*, *159*, 319-326. PMCID: 28359540

26. Park, J., Bermudez[u], V., Roberts, R. C[u]., & **Brannon, E. M.** (2016). Non-symbolic approximate arithmetic training improves math performance in preschoolers. *Journal of Experimental Child Psychology*, *152*, 278-293. PubMed PMID: 27596808; PubMed Central PMCID: PMC5053875.
27. Starr, A., & **Brannon, E. M.** (2016). Visuospatial working memory influences the interaction between space and time. *Psychonomic bulletin & review*, 1-7.
28. DeWind, N.K., **Brannon, E. M.**, (2016). Significant Inter-Test Reliability Across Approximate Number System Assessments, *Frontiers in Psychology, Cognition:* doi: 10.3389/fpsyg.2016.00310; PMID:27014126, PMCID: PMC4781867
29. Cantlon J.F., Merritt D.J., & **Brannon E.M.** (2016). Monkeys display classic signatures of human symbolic arithmetic. Animal Cognition, *19*(2), 405-15. DOI: 10.1007/s10071-015-0942-5. PMCID: PMC6063318
30. Drucker, C.B., Rossa[u], M.A., & **Brannon, E. M.** (2016). Comparison of discrete ratios by rhesus macaques (*Macaca mulatta*), *Animal Cognition.* 19:75–89, DOI: 10.1007/s10071-015-0914-9
31. Drucker, C., Baghdoyan[u], M., **Brannon, E. M.** (2015). Implicit sequence learning in ring-tailed lemurs (*Lemur catta*), *Journal of the Experimental Analysis of Behavior,* 9999, 1–10.
32. DeWind, N.K., G.K. Adams, Platt, M.L. **Brannon, E. M.**, (2015). Modeling the approximate number system; Quantifying the contribution of visual stimulus features, *Cognition, 142, 247-265.* PMCID: PMC4831213
33. Li, R., **Brannon, E. M.**, Huettel, S., (2015). Children do not exhibit ambiguity aversion despite intact familiarity bias. *Frontiers in Psychology,* 5 1519. PMCID: 25601848
34. Park J. Dewind, N., Woldorff, M., & **Brannon, E. M.**, (2015) Rapid and direct encoding of numerosity in the visual stream, 1-16. *Cerebral Cortex,* DOI: 10.1093/cercor/bhv017
35. Starr, A., & **Brannon, E.M.** (2015) Developmental continuity in the link between sensitivity to numerosity and physical size, *Journal of Numerical Cognition, 7-20,* doi: 10.1093/cercor/bhv017
36. Starr, A., & **Brannon, E. M.** (2015). Evidence against continuous variables driving numerical discrimination in infancy, *Frontiers in Developmental Psychology, 6*(923).
37. Drucker, C., & **Brannon, E. M.** (2014). Rhesus monkeys (*Macaca mulatta*) map number onto space, *Cognition, 132*(1), 57-67. PMCID: PMC4031030.
38. Libertus, M., Starr, A., Williamson[u], T., & **Brannon, E.M.** (2014). Number trumps area for 7-month-old infants**,** *Developmental Psychology, 50*(1), 108-112. PMCID: PMC3796133.
39. Park, J., & **Brannon, E. M.** (2014). Improving arithmetic performance with number sense training: An investigation of underlying mechanism, *Cognition, 133*(1), 188-200. NIHMSID: NIHMS614955.
40. Park, J., Chiang[u], C., **Brannon, E.M**., & Woldorff, M. (2014). Experience-Dependent Hemispheric Specialization of Letters and Numbers is Revealed in Early Visual Processing, *Journal of Cognitive Neuroscience* 26.10 (2014): 2239-2249.
41. Pinhas, M., Woldorff, M., & **Brannon, E.M.** (2014). Electrophysiological evidence for the involvement of the approximate number system in preschoolers' processing of spoken number words, *Journal of Cognitive Neuroscience, 26*(9), 1891-1904. NIHMSID: 621122.
42. Jones, S. M., Pearson, J., DeWind, N., Paulsen, D., Tenekedjieva[u], A., & **Brannon, E.M**. (2014). Lemurs and macaques show similar numerical sensitivity. *Animal Cognition, 17*(3), 503-15. PMCID: PMC3966981.
43. Merritt, D.J., & **Brannon, E.M.** (2013). Nothing to it: Precursors to a zero concept in preschool children. *Behavioural Processes*, *93*, 91-97. PMCID: PMC 3582820.
44. Park, J.**,** Li, R., & **Brannon, E.M.,** (2013). Neural connectivity patterns underlying symbolic number processing indicate mathematical achievement in children. *Developmental Science,*

17(2), 187-202. DOI: 10.1111/desc.12114.

45. Park, J., & **Brannon, E.M.** (2013). Training the approximate number system improves math proficiency, *Psychological Science, 24*(10), 2013-1019. PMCID: PMC3797151.
46. Starr, A. Libertus, M.E., & **Brannon, E.M.** (2013). Number sense in infancy predicts mathematical abilities in childhood. *Proceedings of the National Academy of Sciences, 110*(45), 18116-18120. PMCID: PMC3831472.
47. Starr, A., Libertus, M.E., & **Brannon, E.M.** (2013). Infants show ratio dependent discrimination regardless of set size, *Infancy,* 18(6), 1-15. PMCID: PMC3864890.
48. DeWind, N.K., & **Brannon, E.M.** (2012). Malleability of the approximate number system: effects of feedback and training. *Frontiers in Human Neuroscience*, *6*(68). PMCID: PMC3329901.
49. Jones, S.M., & **Brannon, E.M.** (2012). Prosimian primates show ratio dependence in spontaneous quantity discriminations. *Frontiers in Comparative Psychology*, *3*(550). PMCID: PMC3572878.
50. MacLean, E.L., Mandalaywala[u], T.M., & **Brannon, E.M.** (2012). Variance-sensitive choice in lemurs: constancy trumps quantity, *Animal Cognition, 15*(1), 15-25. PMCID: PMC3645319.
51. Paulsen, D.J., Carter, R.M., Platt, M.L., Huettel, S.A., & **Brannon, E.M.** (2012). Neurocognitive development of risk aversion from early childhood to adulthood. *Frontiers in Human Neuroscience, 5*(178). PMCID: PMC3250075.
52. MacLean, E.L., Matthews, L.J., Hare, B. Nunn, C.L., Anderson, R.C., Aureli, F. **Brannon, E.M.**, Call, J., Drea, C.M., Emery, N.J., Haun, D.B.M., Herrmann, E., Jacobs, L.F., Platt, M.L., Rosati, A.G., Sandel, A., Schroepfer, K.K., Seed, A.M., Tan, J., van Schaik, C.P., Wobber, V., (2011). How Does Cognition Evolve?: Phylogenetic Comparative Psychology, *Animal Cognition, 15*(2), 223-238. PMCID: PMC3980718.
53. Cantlon, J.F. Davis, S.W., Libertus, M.E. Kahane, J. **Brannon, E.M.** Pelphrey, K.A. (2011). Inter-Parietal White Matter Development Predicts Numerical Performance in Young Children, *Learning and Individual Differences, 21*(6), 672-680. PMCID: PMC3240671.
54. Cordes, S., & **Brannon, E.M.** (2011). Attending to one of many: When infants are surprisingly poor at discriminating an item's size, *Frontiers in Psychology*, *2*(65). PMCID: PMC3110486.
55. Merritt, D. MacLean, E. Crawford[u], J.C. **Brannon, E. M.** (2011). Numerical rule-learning in ring-tailed Lemurs (*Lemur catta*). *Frontiers in Comparative Psychology, 2*(23), 1-9. PMCID: PMC3113194.
56. Libertus, M.E., **Brannon, E.M.,** Woldorff, M. (2011). Parallels in stimulus-driven oscillatory brain responses to numerosity changes in 7-month-old infants and adults, *Developmental Neuropsychology*, *36*(6), 651-667. PMCID: PMC3638794.
57. Paulsen, D.J., Platt, M.L., Huettel, S.A., &. **Brannon, E.M**., (2011). Decision-making under risk in children, adolescents, and young adults. *Frontiers in Developmental Psychology*, *2*(72). PMCID: PMC3110498.
58. Cantlon, J. F., Safford*, K.E., & **Brannon, E.M.** (2010). Spontaneous Analog Number Representations in 3-year-old Children. *Developmental Science*, *13*(2), 289–297. PMCID: PMC2819667.
59. Jones, M.S., Merritt, D., Cantlon, J., & **Brannon, E.M.** (2010). Context affects the numerical semantic congruity effect in rhesus monkeys. *Behavioral Processes*, *83*(2), 191-196. PMCID: PMC3677752.
60. Libertus, M., & **Brannon, E.** (2010). Stable individual differences in number discrimination in infancy. *Developmental Science*, *13*(6), 900-906. PMCID: PMC2966022.

61. Merritt, D., Casasanto, D., **Brannon, E.M.** (2010). Do monkeys think in metaphors? Representations of space and time in monkeys and humans, *Cognition, 117*(2), 191-202. PMCID: PMC2952654.
62. Paulsen, D., Woldorff, M., & **Brannon, E.M**. (2010). Individual differences in nonverbal number discrimination correlate with event-related potentials and measures of probabilistic reasoning. *Neuropsychologia, 48*(13), 3687–3695. PMCID: PMC2975800.
63. Pearson, J., Roitman, J.D. **Brannon, E.M.** Platt, M.L., & Raghavachari, S. (2010). A physiologically-inspired model of numerical classification based on graded stimulus coding. *Frontiers in Behavioral Neuroscience*, *4*(1). PMCID: PMC2814553.
64. Cantlon, J. F., Libertus, M.E., Pinel, P., Dehaene, S., **Brannon, E.M., &** Pelphrey, K.A. (2009). The neural development of an abstract concept of number. *Journal of Cognitive Neuroscience*, *21*(11), 2217-2229. PMCID: PMC2745480.
65. Cordes, S., & **Brannon, E.M.** (2009). Crossing the divide: Infants discriminate small from large numerosities. *Developmental Psychology, 45*(6), 1583-1594. PMCID: PMC2906140.
66. Cordes, S., & **Brannon, E.M**. (2009). The relative salience of discrete and continuous quantity in young infants. *Developmental Science*, *12*(3), 453-463. PMCID: PMC2949063.
67. Libertus, M., **Brannon, E.M.,** Pelphrey, K. (2009). Developmental changes in category-specific brain responses to numbers and letters in a working memory task. *NeuroImage*, *44*(4), 1404-1414. PMCID: PMC2659412.
68. Libertus, M., Pruitt[u], L., Woldorff, M., & **Brannon, E.M.** (2009). Induced alpha-band oscillations reflect ratio-dependent number discrimination in the infant brain. *Journal of Cognitive Neuroscience*, *21*(12), 2398-2406. DOI: 10.1162/jocn.2008.21162.
69. MacLean, E. L., Prior, S. R., Platt, M. L., & **Brannon, E. M.** (2009). Primate location preference in a double-tier cage: Parsing the effects of illumination and cage height. *Journal of Applied Animal Welfare Science*, *12*(1), 73-81. PMCID: PMC3666575.
70. Merritt, D., Rugani, R., **Brannon, E.M.** (2009). Empty sets as part of the numerical continuum: conceptual precursors to the zero concept in rhesus monkeys. *Journal of Experimental Psychology: General*, *138*(2), 258-269. PMCID: PMC2918401.
71. **Brannon, E.M.,** Libertus, M. Meck, W.H., & Woldorff, M. (2008). Electrophysiological measures of time processing in infant and adult brains: Weber's law holds. *Journal of Cognitive Neuroscience*, *20*(2), 193-203. PMCID: PMC3607948.
72. Cordes, S., & **Brannon, E.M.** (2008). The Difficulties of Representing Continuous Extent in Infancy: Using Number Is Just Easier. *Child Development*, *79*(2), 476-489. PMCID: PMC2906149.
73. Jordan, K.E., Suanda, S., & **Brannon, E.M.** (2008) Intersensory redundancy increases the precision of numerical discrimination in infancy. *Cognition*, *108*(1), 210-221. PMCID: PMC2768652.
74. Jordan, K.E., MacLean, E., & **Brannon, E.M.** (2008) Monkeys match and tally quantities across senses, *Cognition*, *108*(3), 617-625. PMCID: PMC3641156.
75. MacLean, E., Merritt, D., & **Brannon. E.M.** (2008). Social complexity predicts transitive reasoning in prosimian primates, *Animal Behavior*, *76*(2), 479-486. PMCID: PMC2598410.
76. Suanda, U., Tompson[u], W., **Brannon, E.M.** (2008). Changes in the ability to detect ordinal numerical relationships between 9 and 11 months of age, *Infancy*, *13*(4), 308-337. PMCID: PMC2918911.
77. **Brannon E.M.,** Suanda, U., Libertus, K. (2007). Temporal discrimination increases in precision over development and parallels the development of numerosity discrimination, *Developmental*

Science, *10*(6), 770-777. PMCID: PMC2918408.
78. Cantlon, J.F., & **Brannon, E.M.** (2007). Basic math in monkeys and college students. PLoS Biology, *5*(12), e328. PMCID: PMC2140091.
79. Cantlon, J.F., & **Brannon, E.M.** (2007). Adding up the effects of cultural experience on the brain. *Trends in Cognitive Sciences*, *11*(1), 1-4.
80. Cantlon, J. F; **Brannon**, **E**. **M.** (2007). How Much Does Number Matter to a Monkey (*Macaca mulatta*)? *Journal of Experimental Psychology: Animal Behavior Processes. 33*(1), 32-41.
81. Cantlon, J., Fink[u], R., & **Brannon, E.M.** (2007). Heterogeneity impairs numerical matching but not numerical ordering in preschool children. *Developmental Science*, *10*(4), 431-440.
82. Libertus, M.E. Woldorff, M.G., & **Brannon E.M.** (2007). Electrophysiological evidence for notation independence in numerical processing, *Behavioral and Brain Functions*, *3*(1). PMCID: PMC1781950.
83. Merritt, D., MacLean, E., Jaffe, S., & **Brannon, E.M.** (2007). A comparative analysis of serial ordering in ring-tailed lemurs (*Lemur catta*). *Journal of Comparative Psychology*, *121*(4), 363-371. PMCID: PMC2953466.
84. Roitman, J., **Brannon. E.M**., & Platt, M.L. (2007). Monotonic Coding of Numerosity in Macaque Lateral Intraparietal Area. *PLoS Biology, 5*(8): e208. PMCID: PMC1925133.
85. **Brannon, E.M.,** Lutz, D., and Cordes, S. (2006). The development of area discrimination and its implications for number representation in infancy. *Developmental Science, 9*(6), F59-F64. PMCID: PMC1661837.
86. Jordan, K., & **Brannon, E.M.** (2006). A common representational system governed by Weber's Law: nonverbal numerical similarity judgments in six-year-old children and rhesus macaques. *Journal of Experimental Child Psychology, 95*(3), 215-229.
87. Jordan, K., & **Brannon E.M.** (2006). Weber's Law influences numerical representations in rhesus macaques (*Macaca mulatta*), *Animal Cognition,* 9(3), 159-172.
88. **Brannon, E.M.,** Cantlon, J., & Terrace, H.S., (2006). The role of reference points in ordinal numerical comparisons by rhesus macaques (*Macaca mulatta*). *Journal of Experimental Psychology: Animal Behavior Processes, 32*(2), 120-134.
89. Cantlon, J., & **Brannon, E.M.** (2006). Shared system for ordering small and large numbers in monkeys and humans. *Psychological Science*, *17*(5), 401-406.
90. Cantlon, J., & **Brannon, E.M.,** Carter, E.J., & Pelphrey, K. (2006). Functional imaging of numerical processing in adults and 4-y-old children. *PLOS Biology*, *4*(5), e125. PMCID: PMC1431577.
91. Cantlon, J., & **Brannon, E.M.** (2006). The effect of heterogeneity on numerical ordering in rhesus monkeys, *Infancy*, *9*(2), 173-189.
92. Jordan, K., & **Brannon, E.M.** (2006). The multisensory representation of number in infancy. *Proceedings of the National Academy of Sciences*, *103*(9), 3486-3489. PMCID: PMC1413880.
93. Le Corre, M., Van de Walle, G**., Brannon, E.M.,** and Carey, S. (2006). Re-visiting the Competence/Performance Debate in the Acquisition of Counting as a Representation of the Positive Integers. *Cognitive Psychology, 52*(2), 130-169.
94. Roitman, J., **Brannon, E.M.,** Andrews[u], J.R., & Platt, M.L. (2006). Nonverbal representation of time and number in adults. *Acta Psychologica*, *124*(3), 296-318.
95. **Brannon, E.M.** (2005). The independence of language and mathematical reasoning. *Proceedings of the National Academy of Sciences*, *109*(9), 3177-3178. PMCID: PMC552939.
96. **Brannon, E.M.** (2005). What Animals Know About Numbers. In J.I.D. Campbell (Ed.), *Handbook of Mathematical Cognition* (pp. 85-108). New York, NY: Psychology Press.

97. **Brannon, E.M.** (2005). Quantitative thinking: From monkey to human and human infant to adult. In S. Dehaene, J.Duhamel, Hauser, M.D., Rizzolatti, G. (Eds.), *From Monkey Brain to Human Brain* (pp.97-116). Cambridge, MA: MIT Press.
98. Cantlon, J., & **Brannon, E.M.** (2005). Semantic congruity facilitates number judgments in monkeys and humans. *Proceedings of the National Academy of Sciences*, *102*(45), 16507–16511. PMCID: PMC1283437.
99. Lewis, K. Jaffe, S., & **Brannon, E.M.** (2005). Analog number representations in mongoose lemurs (*Eulemur mongoz*): evidence from a search task. *Animal Cognition. 8*(4), 247-251.
100. Jordan, K.E., **Brannon, E.M.,** Logothetis, N.K., Ghazanfar, A.A. (2005). Monkeys match the number of voices they hear to the number of faces they see. *Current Biology 15*(11), 1034-1038.
101. **Brannon, E.M.**, Wolfe[u], L., Meck, W.H., Woldorff, M. (2004). Timing in the baby brain. *Cognitive Brain Research*, *21*(2), 227-233.
102. **Brannon, E.M.,** Abbott[u], S., & Lutz, D. (2004). Number bias for the discrimination of large visual sets in infancy, *Cognition, 93*(2), B59-B68.
103. **Brannon, E.M.,** Andrews, M., & Rosenblum, L. (2004). Effectiveness of video of conspecifics as a reward for socially housed bonnet macaques (*Macaca radiata*). *Perceptual and Motor Skills, 98*(3 Pt. 1)*,* 849-858.
104. **Brannon, E.M.** (2003). Number knows no bounds. Invited commentary in *Trends in Cognitive Sciences*, *7*(7) 279-281.
105. **Brannon, E.M.,** & Roitman, J. (2003). Nonverbal representations of time and number in non-human animals and human infants. In Functional and Neural Mechanisms of Interval Timing Ed., Warren Meck. New York, NY: CRC Press. Pp. 143-182.
106. Terrace, H.S., Son, L., & **Brannon, E.M.** (2003). Serial expertise of rhesus macaques. *Psychological Science*, *14*(1) 66-73.
107. **Brannon, E.M.,** (2002). The development of ordinal numerical knowledge in infancy. *Cognition*, *83*(3), 223-240.
108. **Brannon, E.M**., & Van de Walle, G. (2001). The development of ordinal numerical competence in young children. *Cognitive Psychology*, *43*(1), 53-81.
109. **Brannon, E.M.,** Wusthoff[u], C.J., Gallistel, C.R., & Gibbon, J. (2001). Numerical subtraction in the pigeon: evidence for a linear subjective number scale. *Psychological Science*, *12*(3), 238-243.
110. Gallistel, C.R., **Brannon, E.M.,** Gibbon, J., & Wusthoff, C.J. (2001). Response to Dehaene. *Psychological Science*, *12*(3), 247.
111. **Brannon, E.M.,** & Terrace, H.S. (2000). Representation of the numerosities 1-9 by Rhesus Monkeys (*Macaca mulatta*). *Journal of Experimental Psychology: Animal Behavior Processes*, *26*(1), 31-49.
112. **Brannon, E.M.,** & Terrace, H.S. (1999). Letter to the editor. *Science*, *283*, 1852.
113. **Brannon, E.M.,** & Terrace, H.S. (1998). Ordering of the numerosities 1-9 by monkeys. *Science*, *282*(5389), 746-749.
114. Platt, M.L., **Brannon**, **E.M.,** Briese[u], T.L. & French, J.A. (1996). Differences in feeding ecology predict differences in performance between golden lion tamarins (Leontopithecus rosalia) and Wied's marmosets (Callithrix kuhli) on spatial and visual memory tasks. *Animal Learning and Behavior*, *24*(4), 384-393.

Selected scientific Commentaries on Brannon Publications

- Carey, S. (1998) Knowledge of number: it's evolution and ontology, *Science, 282*, 641-2.

- Azar, B. (2000) Monkeying around with number, *APA Monitor* (31)1.
- Dehaene**,** S. (2001). Subtracting pigeons: Logarithmic or linear? *Psychological Science.* Vol 12(3), 244-246.
- Bower, B. (2002). Numbers in Mind, *Science News* 161, 392-393.
- Bower, B. (2005). Math Minus Grammer, *Science News* 167, 117-118.
- Santos, L R. (2005). Primate Cognition: Putting Two and Two Together, *Current Biology,* 15 (1), R545-R547
- Gross, L. (2006). A Neural Seat for Math? *PLOS, Biology*, 4(5)e149
- Miller, J. (2006) Babies show budding number ability, *Science News*, 169.
- Feigenson, L. (2007) *Trends in Cognitive Science*.
- Dingfelder, S.F. (2007) Monkey Math, *APA monitor* (38) 3.
- Gross, L. (2007). Neurons for numerosity: As quantities increase, so does the neural response. *PLOS, Biology*, 5(8)e226.
- Van Opstal, F. (2007). Labeled-line coding and summation coding of numerosities in prefrontal and parietal cortex. J. of Neuroscience. 27(36)9535-9536.
- Beran MJ., (2008) The Evolutionary and Developmental Foundations of Mathematics. PLoS Biol 6(2): e19 doi:10.1371/journal.pbio.0060019
- Top 100 scientific findings Discover Magazine 2013
- NOVA: The Great Math Mystery, full length documentary
- NSF foundation website (2016) http://www.nsf.gov/discoveries/disc_summ.jsp?cntn_id=138447
- Penn Today, Sep 2019 https://penntoday.upenn.edu/news/MindCORE-living-lab-community-outreach

Scientific Society Memberships

American Psychological Association, American Psychological Society, Comparative Cognition Society, Cognitive Development Society, Cognitive Neuroscience Society, International Society for Infant Studies, Mathematical Cognition and Learning Society, Psychonomics Society, Society for Research in Child Development, Society for Neuroscience

Department and University Service, Penn

- Director of Undergraduate Studies, Psychology July 2019-2022, 2024-2027
- Chair of appointment committee Dolores Alabarcin Fall 2023
- Advisory committee for Psychology Chair 2023-
- Natural Sciences Curriculum committee 2019-2022, 2023-
- MindCore, board member 2019-
- MindCore, outreach committee 2019-
- Mentor Committee Chair, Allyson Mackey 2018-
- Director of honors program, Psychology July 2018-2022
- A&S Personnel committee (all tenure and promotions within the A&S) 2019-2022
- SAS Working Group on Public Policy and Social Impact 2019-2020

- Psychology graduation speaker, May 2018
- Representative for Graduate Admissions Committee, Penn 2016-2018
- Faculty Senate Representation 2016-2019
- A & S Committee on committees 2017, 2019
- Penn Fellows Program 2018-2019
- Vice Provost for Education Fellowship Selection Committee 2018
- Crisis extension tenure committee, Chemistry Department 2018-2019

Department and University Service, Duke

- Presenter for DIBS external advisory board, 12/2014
- Presenter for Leaky Foundation DIBS Presentation 9/26/2014
- Chair of developmental faculty search Spring 2015
- CCN retreat committee 2014
- Faculty co-chair for DIBS Career path workshop, Fall, 2014
- Presenter for DIBS outreach event, Dallas, Texas, January 2014
- Presenter for Duke Parents, March 2014
- Chair of tenure committee, Dr. Michael Tomasello
- Academic Programs Committee (Provost advisory committee) 2013-2015
- Presenter for Duke Forward event, Washington DC, 2013
- Executive committee for Initiative on Human Education and Development, 2013
- Developmental Area head, 2011-2015
- Chair of search committee for developmental psychology, 2011-2013
- Director of Graduate Studies, Cognitive Neuroscience Admitting Program, 2008-2009, 2010-2016
- Tenure review committee for Dr. Stephen Mitroff, 2011
- Review committee for Dean of Engineering School, 2011-2012
- Tenure review committee for Brian Hare, Evolutionary Anthropology, 2011
- Third year review committee for Makeba Wilbourn, 2010-2011
- Third year review committee for Amy Joh, 2010-2011
- Member of P&N chair advisory committee 2008-2009, 2010-2012
- Tenure review committee for Dr. Elizabeth Marsh, 2011
- Director of Graduate Studies, P&N, 2008-2009
- Third year review committee for Stephen Mitroff, 2008-2009
- Member of search committee for chair of Evolutionary Anthropology 2008-2009
- Member of steering committee for Primate Genomics Initiative 2008-2010
- Member of Director's Board Duke Lemur Center, 2006-2009
- Faculty organizer of Developmental Brown Bag 2007-2009
- Faculty organizer of Cognitive Development Brown Bag 2006-2007
- Research board for the Duke Primate Center (protocol review) 2004-2010
- Member of search committee for cognitive development area, 2007-2008
- Member of Bylaws committee for P&N Spring 2007-2008
- Organizer for Topics in Cognitive Neuroscience Talk Series Spring 2007
- Faculty Advisor for Student magazine "The Duke Mind," 2007-2008
- Member of search committee for cognitive primatology position, 2005-2006

- Associate Director of Graduate Studies 2002-2005
- Department ethics representative *2001-2005, 2007-2009, 2011-2013*
- Member of search committee for behavioral genetics position, 2004-2005
- Internal Advisory Board for the Duke Primate Center 2002-2005
- Member of search committee for Director of Center for Cognitive Neuroscience 2002

Teaching

Courses taught at Penn

Educational Neuroscience, Spring 2018
Thought without Language, Spring 2017, Spring 2024
Developmental Psychology, Fall 2016, 2017, 2018
Psychology honors seminar, 2018-2019, 2019-2020, 2020-2021, 2021-2022

Courses taught at Duke:

Educational Neuroscience Seminar Spring 2014
Bass seminar 2013-2014
Professional Development Course for graduate students (2010-2015)
Thought without Language seminar (Spring 2001, 2002, 2003, 2004, 2005)
Developmental Psychology lecture course (Fall 2002, 2004, 2006, 2007, 2012)
Graduate seminar Nonverbal Cognition (Spring 2004)
Graduate seminar in Cognitive Neuroscience (Spring 2008)
Graduate seminar in Advanced Topics in Cognitive Development (Spring 2011, Fall 2012, Fall, 2014)

Current graduate students:

Puneet Bhargava 2023-
Chuyan Qu 2019-

Past graduate students

Kerry Jordan, PhD, May 2007; Associate professor Utah State University
Jessica Cantlon, PhD October 2007; Associate professor Carnegie Melon
Melissa Libertus, PhD, May 2010; Associate professor University of Pittsburg 2013-
David Paulsen, PhD May, 2012; Data Scientist
Sarah Jones, PhD May, 2012; Associate Professor Berea College
Nick Dewind, PhD November, 2014; Post-doc with Brannon
Ariel Starr, PhD May, 2015, NSF recipient; Assistant Professor University of Washington
Carline Drucker, NSF recipient, PhD May, 2016
Rosa Li, NSF recipient, 2011-2017; Teaching Assistant Professor
Rose Schneider, NSF recipient, 2016-2017 (Masters degree)
Emily Szkudlarek 2014-2019, postdoctoral associate University of Wisconsin
Wenting Cai GSE Masters student 2021-2022

Current postdoctoral students:

Sami Yousif 2022-

***Past Postdoctoral Students*:**

Kerrie Lewis 2002-2004; Associate Professor, Texas State University 2006-

Donna Lutz 2003-2005; nonacademic job
Dustin Merritt 2006-2011; nonacademic job
Jamie Roitman 2002-2006; Associate Professor, University of Illinois, Chicago
Sara Cordes 2005-2009; Associate Professor, Boston College
Michal Pinhas 2011-2013, Assistant professor, Ariel University
Joonkoo Park 2011-2014, Assistant professor, University of Massachusetts, Amherst
Nick DeWind 2015-2020 nonacademic job
Stephanie Bugden 2015-2021, Assistant professor Department of Psychology, University of Winnipeg
Rosa Rugani 2018-2020 Assistant professor, University of Padova, Italy
Sam Clarke 2021-2023

Competitive Funding awarded to my graduate students & postdocs
NSF Graduate Fellowship, Kerry Jordan 2004-2007
APA American Psychological Association Dissertation award, Kerry Jordan 2006-2007
NSF Graduate Fellowship, Jessica Cantlon 2004-2007
NRSA Graduate Fellowship, David Paulsen 2010-2012
APA Elizabeth Koppitz Fellowship, Jessica Cantlon 2007-2008
NRSA Postdoctoral Fellowship, Sara Cordes 2006-2009
NRSA Postdoctoral Fellowship, Dustin Merritt 2009-2011
NRSA Predoctoral Fellowship, David Paulsen 2010-2013
Hitchings New Investigator Award, Melissa Libertus, 2006
STERN dissertation award, Melissa Libertus, 2009-2010
Broad Graduate Fellowship, Nick DeWind, 2011-2012
NSF Graduate Fellowship, Ariel Starr, 2012-2015
DIBS postdoctoral fellowship, Joonkoo Park 2012-2013
NSF Graduate Fellowship, Caroline Drucker, 2013-2016
NSF Graduate Fellowship, Rosa Li, 2013-2016
SRCD dissertation improvement award, Ariel Starr, 2014-2015
Trice family award, Caroline Drucker 2015-2016
JB Duke award Emily Szkudlarek 2014
NSF graduate fellowship, Rose Schneider 2016-2017
NRSA Graduate Fellowship, Emily Szkudlarek 2018-2019
K99 award Stephanie Bugden 2019-2024

Graduate student dissertation committees (not including my own students):
Susan Ormsbee, PBS, defended PhD Spring 2003
Tracy Barrett, PBS, defended PhD April 2004
Michelle Merrill, Biological Anthropology, defended PhD April 2004
Aaron Sandler, Neurobiology Department, defended PhD 2006
Jose Larrauri, Psychology and Neuroscience, defended PhD, July 2008
Jen Gibbons, Psychology and Neuroscience, MAP committee 2009
Evan MacLean, Evolutionary Anthropology defended PhD 2012
Amrita Nair, Neurobiology defended 2013
Kait Clark, Psychology and Neuroscience, defended PhD, 2014
Amy Winecoff, Psychology and Neuroscience
Courtnea Rainey, Psychology and Neuroscience

Daniel Pages, Psychology and Neuroscience
Emma Wu Dowd, Psychology and Neuroscience
Christopher Krupenye, Evolutionary Anthropology
Joe Barter, Psychology and Neuroscience
Kristin Johnson, Psychology and Neuroscience
Kelsey Lucca, Psychology and Neuroscience
Ursula Tooley, Psychology UPenn
Barnes Januzzi, Psychology, UPenn

Undergraduate independent studies and practicums:
Duke Evolutionary Anthropology (3) (Talia Baghdoyan with distinction in the major, 2014)
Duke Biology (3)
Duke Psychology (over 40 students since 2000, many with distinction in the major)
(Rachel Roberts, with distinction in the major 2014; Cayley Larimer, 2015, Mary Hagan, 2016)
Duke Neuroscience (Crystal Chiang, Anchal Sabharwal, Marley Rossa with distinction in the major 2014; Sonia Godbole, 2015; Pawan Mathew, 2015)

Undergraduate students who coauthored publications as a result of independent study or work-study collaborations Sara Abbott, Whitney Tompson, Laura Pruitt, Lauren Wolfe, Rebecca Fink, Kelley E. Safford, Tara Mandalwaya, Jeremy Crawford, Crystal Chiang, Rachel Roberts, Vanessa Bermudez, Talia Baghdoyan, Rachel Roberts, Isaac Dayan, Francesca Luzzi

Penn Psychology, Cognitive Science, or BBB/Neuroscience Independent Studies:
Riann Winget 2016-2017, I'mani Sellers 2016-2017, Mikae Sakanaka 2016-2017, Mikaela Rowe Spring 2017, Isaac Dayan 2017-2018, Ashley Sayles 2017-2018, Chung Chae 2017, Grace Ragi, 2018-2019, Jennifer Nazario 2018-2019, Jessica George 2019-2020, Angela Ji 2019-2020, Julia Comer 2019-2020, Harriet DeGroot 2019-2020, Feiyi Wang 2019-2020, Jonathan Shulman 2019-2020, Chris Muracca 2019-2020 (recipient of Eliot Stellar Prize), Gordon Ho 2020-2021, Dana Lane 2020-2021 (Cog Sci), Wenyi Xu 2020-2021 (CURF award), Ashley Barrett Fall 2020, Kareen Fares Fall 2020, Michael Auble, Holland Stevens, Ivan You, Spring 2021; Wenyi Xu 2021-2022, Emily Orengo 2021-2022, Ryan Le 2021-2022, Allison Schachter Fall 2021, Eliza Sandler 2021-2022
Kennon Moon 2022-2023, Olivia Kenny 2022-2023, Natalie Driscoll 2022-2023, Lily Goldstein 2022-2023, Francesca Luzzi 2022-2023; Athul Nair 2023-2024, Francesca Luzzi (honors) 2023-2024. Isabel Riley 2024

Mentor for Mechanisms of Behavior NSF summer students (2000-2010)
Mentor for Howard Hughes Summer Undergraduate Students (2000-2004, 2006)
Mentor for Howard Hughes High School interns (3 students 2003-2004, 2006, 2007)
Mentor for Vertical Integration Program (2 students, 2006; 4 students, 2007; 1 student, 2008)
Mentor for high school students from North Carolina School of Science and Math 2008-2009, 2013-2014, 2014-2015
Mentor for Upenn IMB Undergraduate Summer Fellows Program, 2017
Mentor for PURM students summer 2018 (Dominique Martinez, Deena Elul)
Mentor for String 2 Theory high school students, Summer 2018
Mentor for PURM students summer 2019 (Emily Kopp, Natalie Edman)
Mentor for MindCore student, David Koestler, 2023

Conference Talks and Posters

2023

- Qu, C., Bonner, M. F., & Brannon, E. M. (2023). Contextual coherence increases perceived numerosity independent of semantic content. Poster accepted at the annual meeting of the *Vision Sciences Society*, May 18-23, St. Petersburg, FL.
- Qu, C., Luzzi, F. A., Wang, R., Clarke, S., & Brannon, E. M. (2023). Modeling the effect of color entropy and connectedness on numerosity perception throughout development with the diffusion model. Talk accepted at the 2023 *Mathematical Cognition and Learning Society Conference*.
- Yousif, S.R., Clarke, S., and Brannon, E.M. (2023, July). *Do humans visually adapt to number, or just itemhood?* Poster presented at the 45th Conference of the Cognitive Science Society. Australia
- Yousif, S.R., Clarke, S., and Brannon, E.M. (2023, June). *Do humans visually adapt to number?* Talk presented at the annual meeting of the Society for Philosophy and Psychology (SPP).
- Yousif, S.R., Clarke, S., and Brannon, E.M. (2023, May). *Strong evidence against number adaptation.* Poster to be presented at the annual meeting of the Vision Sciences Society (VSS).

2021

- Bugden, S., & Brannon, E.M. (2021). Producing and verifying ordered sequences of numerals tap distinct cognitive processes in adults and children. *Symposium speaker at the Mathematical Cognition and Learning Society Conference* [Virtual symposium, September 9).
- Qu, C., Szkudlarek, E., & Brannon, E.M. (2021) Approximate multiplication in young children prior to math instruction. Talk given at the 2021 *Mathematical Cognition and Learning Society Conference*.
- Qu, C., & Brannon, E. M. (2021). Approximate division on multiple visual ensembles. Poster given at the *Proceedings of the Annual Meeting of the Cognitive Science Society* (Vol. 43, No. 43)

2020

- Bugden, S., & Brannon E.M. The Mathematical Cognition and Learning Society Annual Conference, Dublin, Ireland.
- DeWind, N.K., Bonner, M.F., Muracca, C., Brannon, E.M. (2020, June). *Coherent arrays appear more numerous.* The Mathematical Cognition and Learning Society Annual Conference, Dublin, Ireland.
- Qu, C., & Brannon E.M. The Mathematical Cognition and Learning Society Annual Conference, Dublin, Ireland.

2019

- Szkudlarek, E., Brannon, E.M. "Intuitive Division in Non-symbolic and Symbolic Format" *Biennial Meeting of the Society for Research in Child Development,* Baltimore, MD, March 2019
- Roberts, R., DeWind, N. & Brannon E.M. SRCD, Baltimore

2018

Szkudlarek, E., Brannon, E.M. "Non-symbolic Ratio Reasoning in Children and Adults" Mathematical Cognition and Learning Society, Oxford, United Kingdom, April 2018

- Szkudlarek, E., Brannon, E.M. "Intuitive Division Before Formal Instruction" International Mind,

Brain, and Education Society, Los Angeles, CA, September 2018

- Szkudlarek, E., Brannon, E.M. "Non-symbolic Division Ability Mediates the Relation between Visual Number Discrimination Acuity and Symbolic Math Skill" Vision Sciences Society, St. Pete Beach, FL, May 2018
- Bugden, S. & Brannon E.M. IMBES

2017

- Bugden, S., & Brannon E.M. Society for Neuroscience
- Szkudlarek, E., Brannon, E.M. "Proportional and Probabilistic Reasoning in Primates and Children", *Cognitive Development Society*, Portland, OR, October 2017
- Szkudlarek, E., & Brannon E.M. Approximate arithmetic training in preschoolers, Society for Research in Child Development. Austin, TX.

2016

- DeWind NK, Peng JY, Brannon EM, Platt ML**.,** *Pharmacological inactivation of intraparietal sulcus reveals a causal role in ordinal comparison in macaque monkeys* Talk presented at Neuroscience 2016, San Diego, CA
- Starr, A., Roberts, R.C., & Brannon, E.M. (2016). Two potential mechanisms underlying the link between approximate number representations and symbolic math in preschool children. *Proceedings of the 38th Annual Conference of the Cognitive Science Society*. Austin, TX: Cognitive Science Society.

2015

- Li, R., Brannon, E.M., & Huettel, S.A. (2015). Ambiguity aversion is absent in 8-year-old children. Poster presented at the Summer Institute for Bounded Rationality, Berlin, Germany. Best poster award.
- Park, J. Bermudez, V., and Brannon, E.M. Early childhood math intervention via number sense training, SRCD, Poster presented at the biennial meeting of the Society for Research in Child Development. Philadelphia, PA.
- Starr, A., DeWind, N.K., & Brannon, E.M. (2015, March). The role of non-numerical stimulus features in the development of the number sense. Oral paper presented at the biennial meeting of the Society for Research in Child Development. Philadelphia, PA.

2014

- DeWind, N., Brannon, E.M., Platt. M.L. Poster presented The Society for Neuroscience, 2014
- Li, R., Brannon, E.M., & Huettel, S.A. (2014). Ambiguity aversion is absent in 8-year-old children. Poster presented at the Flux Congress, Los Angeles, CA.
- Park J, DeWind N, Woldorff MG, **Brannon E.M.** Abstraction of number concepts from visual percepts in the human brain. Mathematical Cognition Conference. 2014. Arlington, VA.
- Park J, DeWind N, Woldorff MG, **Brannon E.M.** Abstraction of number concepts from visual percepts in the human brain. Cognitive Neuroscience Society. 2014. Boston, MA.
- Starr, A., DeWind, N.K., & **Brannon, E.M.** (2014, September). The role of non-numerical stimulus features in the development of the number sense. Poster to be presented at the annual meeting of Flux, The International Congress for Integrative Developmental Cognitive Neuroscience. Los Angeles, CA.

- Starr, A. & **Brannon, E.M.** (2014, July). Infants simultaneously encode numerical and temporal information. Poster presented at the biennial meeting of the International Conference for Infant Studies. Berlin, Germany.

2013

- Drucker, C.B., **Brannon, E.M**., & Platt, M. L. Transcranial magnetic stimulation of macaque intraparietal sulcus impairs numerical processing. Society for Neuroscience Annual Meeting, San Diego.
- Starr, A., & **Brannon E.M.** (2013, October). Shared and separable representations of magnitude in 4-year-old children. Poster presented at the biennial meeting of the Cognitive Development Society. Memphis, TN.
- Starr, A., Libertus, M.E., & **Brannon, E.M.** (2013, May). ANS acuity in infancy predicts ANS acuity in early childhood. Poster presented at the Math Cognition Conference. Bethesda, MD.
- Starr, A., Libertus, M.E., & **Brannon, E.M.** (2013, April). Infants show ratio-dependent discrimination regardless of set size. Paper presented at the biennial meeting of the Society for Research in Child Development. Seattle, WA.
- Starr, A., Libertus, M.E., & **Brannon, E.M.** (2013, April). ANS acuity in infancy predicts ANS acuity in early childhood. Poster presented at the biennial meeting of the Society for Research in Child Development. Seattle, WA.

2012

- Pinhas, M., Paulsen, D. J., & **Brannon, E. M.** (October, 2012). Individual differences in preschoolers' numerical acuity modulate event-related potential ratio effects. Paper presented at the 42nd annual meeting of the Society for Neuroscience, New Orleans, USA.
- Pinhas, M., Donohue, S. H., Woldorff, M. G., & **Brannon, E. M.** (April, 2012) Electrophysiological recordings of brain activity in preschoolers reveals the conceptual processing of spoken number words. Poster presented at the 19th annual meeting of the Cognitive Neuroscience Society, Chicago, USA.
- Starr, A., Libertus, M.E., & **Brannon, E.M.** (2012, June). Small number discrimination in infancy: a case for approximate number representations. Poster presented at the biennial meeting of the International Society for Infant Studies. Minneapolis, MN.
- Starr, A., & **Brannon, E.M.** (2012, June). Sound-shape congruency in preverbal infants. Poster presented at the biennial meeting of the International Society for Infant Studies. Minneapolis, MN.

2011

- **Brannon, E. M.**, Pinhas, M., Starr, A., & Libertus, M. (October, 2011). Relationship between early and later developing numerical abilities. Annual principal investigators meeting of the Research and Evaluation on Education in Science and Engineering (REESE) program, National Science Foundation, Washington, USA
- Jones, S., & **Brannon, E.M.** Conference on Comparative Cognition
- Cordes, S., & **Brannon, E.M.** 8-Month Olds Know Words Refer to Number: Verbal Labels Enhance Large Number Discrimination in Preverbal Infants, SRCD, Montreal
- Paulsen, D.J., Carter, M., Platt, M.L., Huettel, S.A., &. **Brannon, E.M.** Risky Decision Making and Development: Behavioral Trajectories and Neural Recruitment From Early Childhood to Adulthood, SRCD, Montreal
- Paulsen, D.J., Carter, M., Platt, M.L., Huettel, S.A., & **Brannon, E.M.** Risky Decision Making

and Development: Behavioral Trajectories and Neural Recruitment From Early Childhood to Adulthood, Cognitive Neuroscience Society

2010

- Libertus, M., **Brannon, E.M.,** & Woldorff, M. (2010). Time course of stimulus-driven oscillatory synchronization and adaptation to numerical changes. Annual Meeting of the Cognitive Neuroscience Society (CNS), Montreal, Canada.
- Libertus, M., & **Brannon, E.M.** (2010). Developmental trajectory of the relationship between numerical discrimination and other cognitive abilities in infancy. 17th Biennial International Conference on Infant Studies (ICIS), Baltimore.
- Paulsen, D., Carter, M., Huettel, S., Platt, M., & **Brannon, E.** (2010). Risky decision making in young children activates prefrontal and posterior parietal regions, Cognitive Neuroscience Society, Montreal, QB
- Paulsen, D., Carter, M., Huettel, S., Platt, M., **Brannon, E.** (2010). Risky decision making and development: neural recruitment from childhood to adulthood, Society for Neuroeconomics, Evanston, IL.
- Paulsen, D., Carter, M., Platt, M., Huettel, S., **Brannon, E.** (2010). Risky decision making and development: neural recruitment from childhood to adulthood. Society for Neuroscience, San Diego, CA.

2009

- Cantlon, J. F., & **Brannon, E. M.** (2009). The evolution of numerical cognition: Evidence from non- human primates. AAAS Annual Meeting, Chicago, IL.
- Cordes, S., Platt, M., & **Brannon, E. M.** (2009). Hot handed kids and gambling adults: Strategy reversal in risky decision making from childhood to adulthood. Society for Research in Child Development, Denver, Co.
- DeWind N.D., **Brannon E.M.,** & Platt M.L. (2009). November. Neural encoding of numerosity in the ventral intraparietal area in numerically naïve rhesus monkeys. Society for Neuroscience, Chicago, IL.
- Jones, S. M., Cantlon, J. F., & **Brannon, E. M.** (2009). Numerical sensitivity of lemurs. International Conference on Comparative Cognition, Melbourne, FL.
- Libertus, M., & **Brannon, E. M.** (2009). Evidence for Weber's Law in infants' numerical
- discriminations from a new change detection paradigm. Society for Research in Child
- Development, Denver, CO.
- Libertus, M., **Brannon, E. M.**, & Woldorff, M. (2009). Stimulus-driven oscillatory responses to numerical changes: a novel frequency-tagging EEG paradigm. Cognitive Neuroscience
- Society, San Francisco, CA.
- Merritt, D. J., Casasanto, D., & **Brannon, E. M.** (2009). Do monkeys use space to think about time? Society for Research in Child Development, Denver, CO.
- Merritt, D. J., Casasanto, D., & **Brannon, E. M.** (2009). The effects of space on time judgments in rhesus monkeys and humans. Comparative Cognition, Melbourne, FL.
- Paulsen, D., Carter, M., Huettel, S., Platt, M., & **Brannon, E. M.** (2009). Heterogeneity in risky decision making in 6- to 7-year-old children. Society for Research in Child Development, Denver, CO.
- Paulsen, D., Carter, M., Huettel, S., Platt, M., **Brannon, E.** (2009). Neurometrics of risky decision

making in 6- to -7-year-old children, Society for Neuroeconomics, Evanston, IL.

2008

- Cantlon, J. F., & **Brannon, E. M.** (2008). Basic math in monkeys. Society for Neuroscience, Washington, D.C.
- Cantlon, J. F., **Brannon, E. M.,** & Pelphrey, K. A. (2008). Cortical organization of visual categories in preschool (2008). Cortical organization of visual categories in preschool children. Concepts, Objects, and Actions Meeting, Rovereto, Italy.
- Cordes, S., Suanda, S., & **Brannon, E. M.** (2008). Developmental limitations on numerical ordinal abilities. International Conference on Infant Studies, Vancouver, BC.
- Libertus, M., **Brannon, E. M.**, & Pelphrey, K. (2008). Working memory for numbers, letters, and faces in 8-year-old children and adults. Cognitive Neuroscience Society, San Francisco, CA.
- Paulsen, D., Huettel, S., Platt, M., & **Brannon, E. M.** (2008). Heterogeneity in risky decision making in 6- to 7-year-old children. Society for Neuroeconomics, Park City, UT.
- Paulsen, D., Woldorff, M., & **Brannon, E. M.** (2008). Event-related potential signatures of detecting numerical difference. Society for Neuroscience, Washington, D.C.

2007

- MacLean, E. L., Merritt, D. J., & Brannon, E. M. (2007). Transitive inference in two species of prosimian primates [Abstract]. *American Journal of Primatology, 69(S1)*, 102.
  Merritt, D. J., MacLean, E. L., & Brannon, E. M. (2007). Serial order processing in ring-tailed lemurs (Lemur catta) [Abstract]. *American Journal of Primatology, 69(S1)*, 101.
- Cantlon, J.F., Libertus, M.E., **Brannon, E.M**., & Pelphrey, K.A. Symbolic & Non-symbolic Number in the Developing Brain. Cognitive Neuroscience Society, New York, May 2007.
- Cordes, S., Lutz, D., & **Brannon, E. M.** Discriminations of Small from Large Sets in Human Infants. Society for Research in Child Development, Boston, March 2007.
- Jordan, K., & **Brannon, E.M**. Developmental changes in numerical matching performance across stimulus format and modality. Society for Research in Child Development, Boston, March 2007.
- Libertus, M. E., Libertus, K., Suanda, S. H., Woldorff, M. G., Meck, W., & **Brannon, E. M**. Behavioral and Neurophysiological Correlates of Interval Timing in Human Infants Follow Weber's Law. Society for Research in Child Development, Boston, March 2007.
  Libertus, M. W., Pruitt, L. B., Woldorff, M. G., **Brannon, E. M.** Electrophysiological markers of number processing in 7-month-old infants. Cognitive Neuroscience Society, New York, May 2007.
- MacLean, E. L., Merritt, D. J., & **Brannon, E. M.** Learning to learn and transitivity in prosimians. Society for Research in Child Development, Boston, March 2007.
- Suanda, S.H., & **Brannon, E.M.** Ordinal numerical knowledge in infancy: What develops between 9 and 11 months? Society for Research in Child Development, Boston, March 2007.

2006

- Roitman, J., **Brannon, E.M.,** Platt, M.L. Representation of numerical magnitude in posterior parietal cortex. Society for Neuroscience, Atlanta, October 2006
- **Brannon, E.M.** et al., Comparative and developmental approach to studying nonverbal numerical cognition. Psychonomics, Houston, 2006

- Jordan, K.E., & **Brannon, E.M.** Infants' multisensory representation of number. International Society for Infant Studies, June 2006
- Jordan, K.E., & **Brannon, E.M.** Monkeys match sequentially presented sets with simultaneously presented arrays based on numerosity. Vision Science Society, May 2006
- Cantlon J.F., & **Brannon, E.M.** Numerical processing of visual arrays in the brains of adults and four-year-old children. Vision Science Society, May 2006.
- Roitman, J., **Brannon, E.M.,** Platt, M.L. Representation of numerical magnitude in posterior parietal cortex. Vision Science Society, May 2006
- Cantlon J.F., **Brannon, E.M.,** Pelphrey, K. Notation-Independent Number Processing in Adults and Four-year-old Children. Cognitive Neuroscience Society, April 2006.
- Libertus, M. Woldorff, M., **Brannon, E.M.** Electrophysiological Correlates of Number Comparisons. Cognitive Neuroscience Society, April 2006

2005

- Libertus, K., Libertus, M.E., Meck, W.H., Woldorff, M., **Brannon, E.M.** Behavioral and neurophysiological correlates of time processing in human infants. Society for Neuroscience, Washington DC 2005
- Jordan, K.E., & **Brannon, E.M.** Infants match numerosities across the visual and auditory modalities. Cognitive Development Society, San Diego, October 2005
- **Brannon, E.M.,** Libertus, M., Meck, W.H., & Woldorff, M. Neurophysiological correlates of time processing are modulated by interval differences in human infants and adults. Cognitive Neuroscience Society, 2005
- Jordan, K.E., & **Brannon, E.M.** Monkeys Match the Number of Voices They Hear to the Number of Faces They See. Vision Science Society, Sarasota, May 2005
- Cantlon J.F., & **Brannon, E.M.** Relative Salience of Number, Shape, Color, and Surface Area in Rhesus Monkeys. Vision Science Society, May 2005
- Cantlon, J.F., Fink, R., & **Brannon, E.M.** The effect of heterogeneity on numerical judgments in monkeys and young children. SRCD 2005
- Roitman J.D., **Brannon E.M.**, & Platt M.L. 2005. Implicit discrimination of visual arrays by number in rhesus macaques. Journal of Vision 5(8), 1044.
- Jordan, K.E., Fink, R., & **Brannon, E.M.** Nonverbal Number Representation in Monkeys and Children: A Number Bisection Task. SRCD, Atlanta, April 2005
- Lutz, D., & **Brannon, E.M.** SRCD 2005

2004

- Roitman, J. **Brannon, E.M.,** Andrews, J.R., & Platt, M.L. 2004. Nonverbal analog encoding of time and number in adult humans. Soc Neurosci Abst 30. 176.16.
- Jordan, K.E. & **Brannon, E.M.** 2004. Cardinal Number Representation in Rhesus Macaques. Poster presented at the annual Comparative Cognition Conference, Indialantic, FL.
- Lewis K., & **Brannon, E.M.** 2004. Quantitative and learning capacities of lemurs. Poster presented at the annual Comparative Cognition Conference, Indialantic, FL.
- Cantlon, J., Lewis, K., & **Brannon, E. M.** 2004. Monkeys count up and down: Conditional numerical ordering in rhesus macaques. Comparative Cognition Conference, Melbourne Beach, Florida.

- Jordan, K.E. and **Brannon, E.M.** 2004. Rhesus Macaques' Performance on a Number Bisection Task. Proceedings and Abstracts of the Annual Meeting of the Eastern Psychological Association, 75, 45.

2003

- Jordan, K.E. and **Brannon, E.M**. 2003. Cardinal Number Representation in Rhesus Monkeys. Poster presented at the North Carolina Cognition Group.
- Roitman J.D., Andrews J.A., **Brannon E.M.,** & Platt M.L. 2003. Time and number discrimination in the monkey and humans. Soc Neurosci Abstr 29: 180:11.
- **Brannon, E.M.,** Gautier, T. Number and Continuous Stimulus Dimensions. 2003 SRCD
- **Brannon, E.M.,** Numerical thinking: A comparative study, Presidential symposium Eastern Psychological Association, 2003.
- **Brannon, E.M.,** 2003. Development of serial ordering in infants, OECD. Brockton, MA.

2002

- **Brannon, E.M.**, Wolfe, L., Meck, W.H., Woldorff, M. 2002. Electrophysiological correlates of timing in human infants. *Society for Neuroscience*, Orlando, FA.
- **Brannon, E.M.**, 2002. The development of ordinal numerical knowledge in infancy. Symposium, *at International Conference on Infant Studies*, Toronto.
- **Brannon, E.M.**, 2002 The development of ordinal numerical knowledge in infancy. *North Carolina Conference on Cognition*.

1999-2001

- **Brannon, E.M.,** 2001. Ordinal numerical representations in human infants: A comparative perspective. *Abstracts of Psychonomic Society*, 6, 42.
- Kovary, I., **Brannon, E.M.,** & Terrace, H.S. 2000. Further investigations of number representations in rhesus monkeys. *International Conference on Comparative Cognition*.
- **Brannon, E.M., &** Van de Walle, G. 1999. Knowledge of numerical ordinal relations in 2- to 3-year olds. Poster presented *at Society on Research in Child Development*, New Mexico.
- **Brannon, E. M.**, Freidin, L., & Terrace, H. S. 1999. A comparison of the psychophysical functions relating latency and accuracy to numerical distance in rhesus monkeys and human subjects. *Proceedings and Abstracts of the Annual Meeting of the Eastern Psychological Association*.

1996-1998

- **Brannon, E.M.**, & Terrace, H.S. 1998. A comparison of cardinal and ordinal numerical abilities in rhesus monkeys. *Abstracts of Psychonomic Society*, **3**, 39.
- **Brannon, E.M.**, & Terrace, H.S. 1998. Rhesus monkeys transfer an ordinal rule to novel numerosities. International Conference on Comparative Cognition.
- **Brannon, E. M.**, Anderson, E., A, Chen, S., & Terrace, H. S. 1998. Monkeys spontaneously discriminate numerosities 5-9 after training on 1-4. *Proceedings and Abstracts of the Annual Meeting of the Eastern Psychological Association*, **69**, 84.
- Anderson, E.A., **Brannon, E. M.**, Chen, S., & Terrace, H. S. 1998. Recall of
- arbitrary lists by rhesus macaques. *Proceedings and Abstracts of the Annual Meeting of the Eastern Psychological Association*, **69**, 11.

- **Brannon, E.M.**, Anderson, E.A., Chen, S., & Terrace, H.S. 1997. Judgments of relative numerosity in rhesus macaques. *Abstracts of Psychonomic Society*, **2,** 38.
- **Brannon, E. M.**, Anderson, E.A., Chen, S., & Terrace, H.S. 1997. Inferences based on quantity by rhesus macaques. *Proceedings and Abstracts of the Annual Meeting of the Eastern Psychological Association*, **68**, 51.
- Terrace, H.S., Jaswal, V., **Brannon, E.M.**, & Chen, S. 1996 What is a chunk? Ask a monkey. *Abstracts of Psychonomic Society*, **1,** 35.