

Richard W. Prather

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Education

- 2009 Ph.D., Psychology (Cognitive & Cognitive Neuroscience)
University of Wisconsin-Madison
- 2002 S.B., Brain and Cognitive Sciences
Massachusetts Institute of Technology

Positions

- 2014 - current Assistant Professor
Department of Human Development and Quantitative Methods
Human Development Program
Neuroscience & Cognitive Science Program
University of Maryland, College Park
- 2009 – 2014 Postdoctoral Researcher, Indiana University, Department of Psychological and
Brain Sciences

Publications

Prather, R.W. (in press) Neural coding partially accounts for the relationship between children's number-line estimation and number comparison performance. *Journal of Cognition and Development*.

Prather, R.W. (2014) Neural coding variation mediates precision in numerical discrimination. *Cognition*, 133, 601 – 610.

Mix, K., Prather, R.W., Smith, L.B., Stockton, J.D. (2014) Young Children's Interpretation of Multi-Digit Number Names: From Emerging Competence to Mastery. *Child Development*. May-Jun; 85(3), 1306-19.

Prather, R.W. (2012). Connecting neural coding to number cognition: A computational account. *Developmental Science*, 15(4), 589-600.

Prather, R.W. (2012) Implicit learning of arithmetic regularities is facilitated by proximal contrast. *PLoS ONE* 7(10): e48868.

Hattikudur, S., Prather, R.W., Asquith, P., Knuth, E., Nathan, M. J., & Alibali, M. W. (2012). Constructing graphical representations: Middle schoolers' developing knowledge about slope and intercept. *School Science and Mathematics*, 112(4), 230-240.

Prather, R.W. & Alibali, M.W. (2011). Children's acquisition of arithmetic principles: The role of experience. *Journal of Cognition and Development*, 12(3), 332-354.

Prather, R. W. & Alibali, M. W. (2009). Development of arithmetic principle knowledge: How do we know what learners know? *Developmental Review*, 29(4), 221-248.

Prather, R. W. & Alibali, M. W. (2008). Understanding and using principles of arithmetic: Operations involving negative numbers. *Cognitive Science*, 32(2), 445-457

In progress

Prather, R.W., Heverly-Fitt, S. (in review) Prediction of single trial behavior on numerical tasks using a multilayered dynamic systems model.

Prather, R.W., Tavassolie, N. (in review). Individual differences in children's numerical comparison is independent of numerical precision. PsyArXiv osf.io/preprints/psyarxiv/9zc92

Prather, R.W. (in review) Task dynamics reveal how fraction values are constructed.

Publications (invited)

Should the Science March Stick to Just Science? *Scientific American*, April 3, 2017.

Press Coverage

"Kids may be ready for math earlier than you think, new research suggests." *The Washington Post*. December 17, 2013

"SFN Neuroblogging Ideas of Number" *Scientific American*. November 16, 2011.

Honors and Awards

2013 *Training Program in Integrative Developmental Process*
National Institute of Child Health and Development
(5T32HD007475) (Role: Postdoctoral Researchers)

2009 *Making Sense of Mathematical Manipulatives*
Institute of Educational Sciences (R305A080287)
(Role: Postdoctoral Researcher)

2012 Developmental Science Early Career Researcher Prize
Editors: Nelson, C. A., de Haan, M., Quinn, P. and Ansari, D. (2013), A Winner
of 2012 Developmental Science Early Career Research Prize. *Developmental Science*, 16: 792.

- 2007 - 2009 Interdisciplinary Training Program Predoctoral Fellowship (#R305C050055)
University of Wisconsin, Institute of Education Sciences, Department of Education
- 2005 Roderick Menzies Memorial Research Award, University of Wisconsin
Department of Psychology
- 2002 - 2005 Minority Fellowship Program Pre-doctoral Fellowship, American
Psychological Association

Funding

Awarded

- 2017 Research and Scholarship Award (\$10,000 for teaching buyout)
- 2015 University of Maryland Support Program for Advancing Research and
Collaboration (\$15,000)

Submitted

NSF: CAREER Combining deep learning and neuroimaging approaches to improve children's arithmetic knowledge

NSF – Directorate for Developmental Science (Spring 2017) ***Individualized training for arithmetic learning via neuroimaging and computational modeling***

NSF – Directorate for Education and Human Resources. ***Precise and Generalizable Prediction of Behavior via Neural-Mathematical Models*** (Spring 2016)

NICHD: Exploratory/Developmental Research Award (R21): Early Mathematics interventions and training (Spring 2015)

Jacobs Foundation: *Prediction of Children's Learning via Neural-Computational Models* (Spring 2016)

Jacobs Foundation: *Prediction of Children's Learning via Neural-Computational Models* (Spring 2017)

Searle foundation Scholars: *Precise Behavioral Prediction via Neural-Mathematical Models* (Fall 2016)

Simons: *Precise and Generalizable Prediction of Behavior via Neural-Mathematical Models* (Fall 2016)

Spencer Foundation: *Improving Children's Arithmetic using Neural-Computational Models* (Spring 2016)

Foundation for Child Development: *Precision interventions: Individualized early math interventions for students at every skill level* (Spring 2015)

Invited Talks

How do learners construct fraction values? Wisconsin Ideas in Education Series: University of Wisconsin, September 2017

Ready at Five Research Symposium: Keynote Speaker, May 2014

Neural Coding and the Development of Number Cognition

University of Richmond, Department of Psychology, December 2013

University of Buffalo, Department of Psychology, December 2013

University of Maryland, Department of Human Development, November 2013

University of Tennessee, Department of Psychology, September 2013

How neural population codes help us understand numerical cognition

University of Illinois, School of Education December 2012

Tufts University, Department of Psychology December 2012

University of Pittsburgh, January 2012

Conference Presentations & Posters

Richard Prather(2017). *Children's numerical comparison is independent of number representation*. Cognitive Development Society

Richard Prather & Sara Heverly-Fitt (2017) Dynamic System model prediction of individual differences in numerical development. Society for Research in Child Development

Richard Prather & Sara Heverly-Fitt (2016) Prediction of Single-Trial Behavior using a Layered Dynamic Systems Model with Evolutionary Algorithm Updating, Cognitive Science Society

Richard Prather & Sara Heverly-Fitt (2016) Computational Model and ERP Enabled Prediction of Single Trial Behavior on a Numerical Comparison Task, Cognitive Neuroscience Society

Richard Prather (2015) Predicting Behavior on Mathematical Tasks via Computational Models, Society for Research in Child Development

Richard Prather (2015) Mathematical Models of Developmental Changes in Number Cognition, Cognitive Science Society

Prather, R.W. (2013) Neural coding variation mediates precision of number discrimination. Society for Neuroscience Conference. Development of Numerical Cognition Nanosymposium.

Prather, R.W. (2012) Learning numbers without numbers: Transfer of learning across magnitude domains. Society for Neuroscience Conference. Development of Numerical Cognition Nanosymposium.

Prather, R.W. (2012) The influence of neural coding on numerical cognition. Poster presented at the Society for Cognitive Neuroscience

Prather, R. W. (2011) Further connecting neural coding to number cognition. Society for Neuroscience Conference. Neural Bases of Human Cognition and Attention Nanosymposium. [[Featured in Scientific American](#)]

Prather, R. W., Stitzel, C., Byrge, L., Street, S., Boyer, T., Smith, L.B. (2011) Counting and estimating: Developmental relations between magnitude estimation and counting skill. Cognitive Development Society Conference 2011.

Mix, K., Prather, RW, Stitzel, C., Smith, L. (2010). Place-Value Concepts and Multidigit Calculation: Effects of Concrete Models. Poster presented at the Institute of Education Sciences Research Conference.

Prather, R.W. & Alibali, M.W. (2009) Children's Acquisition of Arithmetic Principles. Presented at the Biennial Meeting of the Society for Research in Child Development, Denver, Colorado.

Alibali, M.W., Prather, R.W., McNeil, N.M. (2009) Are Abstract or Concrete Materials Most Beneficial for Learning? It Depends on Problem Difficulty and Learners Skills. Paper presented at the Biennial Meeting of the Society for Research in Child Development, Denver, Colorado.

Prather, R.W. & Alibali, M.W. (2008). Knowledge and acquisition of arithmetic principles. Poster presented at the Institute of Education Sciences Research Conference, Washington, DC.

Prather, R.W. & Alibali, M.W. (2007). *Children's arithmetic principle knowledge: How do we know what they know?* Poster presented at the Biennial Meeting of the Cognitive Development Society, Santa Fe, NM.

Prather, R. W. & Alibali, M. W. (2007). *Knowledge of an arithmetic principle in symbolic and verbal contexts: Do children know what adults know?* Poster presented at the Biennial Meeting of the Society for Research in Child Development, Boston, Massachusetts.

Alibali, M. W. & Prather, R. W. (2007). *Improvements in problem encoding lead to changes in strategy evaluations.* Poster presented at the Biennial Meeting of the Society for Research in Child Development, Boston, Massachusetts.

Hattikudur, S., Prather, R. W., Asquith, P., Knuth, E., Nathan, M. J., & Alibali, M. W. (2007). *Graphing slope and intercept in middle school.* Poster presented at the Biennial Meeting of the Society for Research in Child Development, Boston, Massachusetts.

Hattikudur, S., Prather, R. W., Asquith, P., Knuth, E., Nathan, M. J., & Alibali, M. W. (2007). *Constructing graphical representations: Exploring middle schoolers' intuitions and developing knowledge about slope and intercept.* Poster presented at the Annual Meeting of the American Educational Research Association, Chicago, Illinois.

Conference Proceedings

Prather, R.W. (2010) Change in Stimuli Encoding Facilitates Principle Acquisition. *Proceedings of the Annual Conference of the Cognitive Science Society*. Mahwah, NJ: Erlbaum.

Street, S., Prather, R.W., Stitzel, C., Smith, L.B., Mix, K. (2010) Preschoolers' Writing of Multidigit Numbers: From an Additive to a Multiplicative Representational System? *Proceedings of the Annual Conference of the Cognitive Science Society*. Mahwah, NJ: Erlbaum.

Prather, R. W. & Alibali, M. W. (2008). Implicit learning of arithmetic principles. In J. McClelland & J. Weng (Eds.), *Proceedings of the 7th IEEE International Conference on Development and Learning*.

Prather, R. W. (2007). Implicit learning of arithmetic principles. In D. Macnamara & G. Trafton (Eds.), *Proceedings of the Twenty-Ninth Annual Conference of the Cognitive Science Society* (p. 1839). Mahwah, NJ: Erlbaum.

Prather, R. W. & Alibali, M. W. (2004). Principles of arithmetic with positive and negative numbers. In K. Forbus, D. Gentner & T. Regier (Eds.), *Proceedings of the Twenty-Sixth Annual Conference of the Cognitive Science Society* (p. 1620). Mahwah, NJ: Erlbaum.

Prather, R. W. & Boroditsky, L. (2003). *Left of zero: Representations of negative numbers on the mental number line*. In R. Alterman & D. Kirsch (Eds.), *Proceedings of the Twenty-Fifth Annual Conference of the Cognitive Science Society* (p. 1394). Mahwah, NJ: Erlbaum.

Davachi, L., Prather, R., & Wagner, A. D. (2002). Integration cost: Fractionating configural representations in working memory. *Abstracts of the Cognitive Neuroscience Society Meeting*, 9, 62.

Teaching Experience

Cognitive Development	Fall 2014, Spring 2015, Spring 2016, Fall 2016, Spring 2017
Cognitive Psychology	Fall 2012, Spring 2013

Advising Experience

2016 – present Graduate Student Kelly Banks

Dissertation Committee Michael Rizzo, Jeeyoung Noh

Portfolio Committee Emily Daubert

2014-2016 Graduate Assistant Sara Heverly-Fitt

Academic & Professional Service

- 2017 Cognitive Neuroscience Society: equity and diversity committee
- 2008 *Diversity Day 2008* Moderated panel on departmental diversity issues
- 2006 - 2009 Climate and Diversity Committee, University of Wisconsin, Department of Psychology

Ad hoc reviewer: Developmental Psychology, Child Development, Cognition, Journal of Cognition and Development, Journal of Experimental Child Psychology, Frontiers in Developmental Psychology, School Science and Mathematics, Cognitive Science Society Conference

Additional Training

- 2013 Developmental Cognitive Neuroscience Summer institute, University of Maryland, College Park, MD
- 2008 Dynamic Field Theory Summer School. University of Iowa, Iowa City, Iowa.
- 2002 Summer Program in Neuroscience, Ethics, and Survival Skills, Marine Biological Laboratory, Woods Hole, Massachusetts