# Josh Medrano, Ph.D.

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# ACADEMIC APPOINTMENTS

2023- **Postdoctoral Scholar**, Kent State University Department of Psychological Sciences PI: Dr. Dana Miller-Cotto

## **EDUCATION**

2019-2023	<b>Ph.D. in Human Development</b> , University of Maryland, College Park Advisor: Dr. Richard W. Prather Dissertation: <i>Integrating perceptual and cognitive processes in mental arithmetic</i>
2018-2019	<b>M.Ed. in Educational Psychology-Applied Developmental Science</b> , University of Virginia Advisor: Dr. Jamie Jirout

2013-2016 B.A. in Psychology, The Ohio State University

# **RESEARCH INTERESTS**

(In no particular order) The role of domain-general skills, such as executive functions and spatial/relational-reasoning, in math and science cognition and learning; mechanisms underlying learning; the role of the physical environment on cognitive development

# STATISTICAL SKILLS

(In no particular order) Univariate and multivariate statistics; general linear models, including linear, logistic, and quintile regressions; exploratory latent and composite variable methods including cluster analyses; structural equation modeling, including path analyses; causal inference; meta-analysis

# **PROGRAMMING SKILLS**

Statistical analysis: R, SPSS, and STATA Data visualization: R and RStudio packages Traditional experiment tools: PsychoPy, OpenSesame, MATLAB, Python, & EyeLink Online experiment: Gorilla Experiment Builder and Qualtrics Web programming: HTML, CSS, Markdown, JavaScript, and Python

## HONORS & AWARDS

2024	NSF Modern Meta-Analysis Research Institute, Washington, DC
2023	Charles H. Flatter Fellowship (\$500)
2023	Ann Wylie/Lee Thornton Dissertation Fellowship Nomination
2022	The David and Winifred "Winkle" Fulk Fellowship Nomination
2022	Cognitive Developmental Society Diversity Travel Award (\$700)
2020	APA Conference Poster Selected for Presidential Poster Session
2019-2023	Department Travel Awards (4 years, \$2,300 total)
2019-2021	Dean's Fellowship, stipend and tuition
2017	AmeriCorps Education Award (\$3,011)
2014-2016	Dean's List

## **GRANT SUPPORT**

Role: Principa	1 Investigator
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2022	NSF STEM Education Postdoctoral Research Fellowship [Not Funded] Title: Finding a model for supporting foundational STEM skills through technology: Executive functions, spatial reasoning, and mathematical skills
2022	Support Program for Advancing Research and Collaboration (SPARC) Award [Funded, UMD] Amount: \$990 Title: Integrating perceptual and cognitive processes in mental arithmetic

Role: Graduate Student Support

2021 Faculty-Student Research Award [Funded, UMD] Amount: \$10,000 Title: *What role does arithmetic history play on adults' math skills?* 

# PEER-REVIEWED PUBLICATIONS

- **Medrano, J., &** Prather, R.W. (2023). Rethinking executive functions in mathematical cognition. *Journal of Cognition and Development*. <u>https://doi.org/10.1080/15248372.2023.2172414</u>
- Medrano, J., Crnosija, N., Prather, R. W., & Payne-Sturges, D. (2022). Bridging the environment and neurodevelopment for children's health: Associations between real-time air pollutant exposures and cognitive outcomes. *Frontiers in Psychology*. <u>https://doi.org/ 10.3389/fpsyg.2022.933327</u>
- Prather, R.W., Benitez, V.L., Kendall Brooks, L., Dancy, C.L., Dilworth-Bart. J., Dutra, N.B., Faison, M.O., Figueroa, M., Holden, L.T.R., Johnson, C., Medrano, J., Miller-Cotto, D. Matthews, P.G., Manly, J.J., Thomas, A.K. (2022). What can cognitive science do for people? *Cognitive Science*. <u>https://doi.org/10.1111/cogs.13167</u>
- Medrano, J.\*, Jaffe, J.,\* Lombardi, D., Holzer, M.A., & Roemmele, C. (2020). Students' scientific evaluations of water resources. *Water*. <u>https://doi.org/10.3390/w12072048</u> \*Co-first authors

Google Scholar: <u>scholar.google.com/citations?user=IrZrHOQAAAAJ&hl=en</u>

# MANUSCRIPTS UNDER REVIEW

- **Medrano, J.** & Prather, R.W. (under review). Interactions between perceptual cues and working memory during mental arithmetic: A dual-task experiment.
- Miller-Cotto, D., Chan, J.Y.-C., & **Medrano**, J. (under review). Identifying challenging topics in mathematics: An analysis of student performance across domains. [Pre-registration: <u>https://osf.io/xfvip</u>].
- Miller-Cotto, D. & **Medrano**, J. (under review). The role of working memory in the effectiveness of faded worked examples.

## MANUSCRIPTS IN PREPARATION

- Medrano, J. & Prather, R.W. (revising for resubmission). Testing the contributions of inhibitory control to arithmetic skills. [Pre-registration: <u>https://osf.io/2aq5n?</u> view\_only=117319d14f3c4663a7c6043ed67e31f2].
- Medrano, J., Mohan, S., & Lombardi, D. (revising for resubmission). The role of inhibitory control and cognitive flexibility in plausibility judgments and scientific evaluations.
- **Medrano, J.,** Devlin, B., Schingledecker, M., Thompson, C.A., & Miller-Cotto, D., (in prep). Individual differences in fraction understanding and relations to EF and spatial/ relational reasoning. [Pre-registration: <u>https://osf.io/98gzv</u>].
- Miller-Cotto, D., & **Medrano**, J. (in prep). Understanding the mechanistic role of working memory in early math learning: to offload or not to offload? A developmental perspective.
- Miller-Cotto, D., **Medrano, J.,** & Zaborowski, S. (in prep). When training is inconclusive: Making a case for supporting instead of training executive functions.
- Miller-Cotto, D., & **Medrano**, J., Thompson, C.A., Devlin, B., & Shingledecker, M. (in prep). Testing theories of working memory with whole number bias: A developmental analysis.
- Miller-Cotto, D., Ribner, A.D., & **Medrano**, J. (in prep). The role of assessor racial identity on Black children's executive function task performance: An initial examination.
- Miller-Cotto, D., Borriello, G.A. & **Medrano, J.** (in prep). A meta-analysis of the correlations between executive functions and spatial skills.

### **CONFERENCE PRESENTATIONS**

## Chaired Symposium

**Medrano**, J. (Chair). *The role of perception in arithmetic cognition* [Symposium]. 2023 Mathematical Cognition and Learning Society Conference, Loughborough, UK.

## **Invited Oral Presentations**

- Medrano, J. & Prather, R.W. (2023, June). Why does inhibitory control only sometimes associate with math? Insights from a review of executive function development research. In Hochman, S. (Chair). *Numerical Cognition Meets Executive Functions Symposium* [Symposium]. University of Surrey, Guildford, UK.
- Medrano, J. & Prather, R.W. (2023, June). Integrating perceptual and cognitive processes in mental arithmetic. In Medrano, J. (Chair). *The role of perception in arithmetic cognition* [Symposium]. 2023 Mathematical Cognition and Learning Society Conference, Loughborough, UK.
- Prather, R.W., & Payne-Sturges, D., Medrano, J., Kendall Brooks, L., Johnson, C., & Crnosija, N.
   (2022, March). An asset-based quantitative framework to characterize cognitive development of African-American children. In Rittle-Johnson, B. (Chair). *Barriers and*

*supports for cognitive development and academic outcomes among marginalized youth.* Bi-ennial Cognitive Development Society Conference 2022, Madison, WI.

Chen, R.\*, Diallo, M.\*, Hancock, M.\*, Lampe, L.\*, Medrano, J.\*, Salt, J.\*, & Wright, J.\* (2019). Motivation analysis of a multiage classroom: Exploring Agnor-Hurt Elementary. The Virginia Chapter of Association for Learning Environments Annual Conference, Williamsburg, VA.

\*Presenters contributed equally.

## **Oral Presentations**

- **Medrano**, J.\*, Crnosija, N.\*, Prather, R.W., & Payne-Sturges, D., (2022). Bridging the environment and neurodevelopment for children's health study: An overview. GradTerp Exchange, College Park, MD.
- Medrano, J. & Prather, R.W. (2021, March). Examining how numerical and non-numerical inhibitory control contribute to arithmetic skills: A path analytical approach. 2021 Mathematical Cognition and Learning Society Conference.

## **Paper Presentations**

Medrano, J., Mohan, S., Jaffe, J.B., & Lombardi, D. (2021, August). Executive functions in plausibility judgments and scientific evaluations [Paper Presentation]. 31st Annual Meeting of the Society for Text and Discourse.

## **Poster Presentations**

Parrish, L.<sup>U</sup>, Medrano, J., & Miller-Cotto, D. (2024, April). Whole number knowledge correlates with working memory and fraction understanding. [Poster Presentation]. 2024 Undergraduate Symposium for Research, Scholarship and Creative Endeavors, Kent State University, Kent, OH.

\*\*\* Poster Judged First Place Among Psychological Sciences Posters

- Ernst, L.<sup>U</sup>, **Medrano**, J., & Miller-Cotto, D. (2024, April). Understanding the underlying cognitive mechanisms of whole number bias in third graders. [Poster Presentation]. 2024 Undergraduate Symposium for Research, Scholarship and Creative Endeavors, Kent State University, Kent, OH.
- Medrano, J., Miller-Cotto, D., Thompson, C.A., Devlin, B., & Shingledecker, M. (2024, March). Individual differences in third and sixth graders' fraction understanding and relations to EF and spatial skills. [Poster Presentation]. 2024 Bi-ennial Cognitive Development Society Conference, Pasadena, CA.
- Crnosija, N., **Medrano**, J., Prather, R.W., & Payne-Sturges, D. (2022, September). The effect of COVID-19 lockdown/post-lockdown and season on children's exposure to PM2.5 and time expenditure by environment type [Poster Presentation]. 34th Annual Conference of the International Society for Environmental Epidemiology, Athens, Greece. <a href="https://doi.org/10.1289/isee.2022.P-0519">https://doi.org/10.1289/isee.2022.P-0519</a>.
- Medrano, J., Crnosija, N., Prather, R.W., & Payne-Sturges, D. (2022, March). Bridging the environment and neurodevelopment for children's health study: An overview [Poster Presentation]. Bi-ennial Cognitive Development Society Conference 2022, Madison, WI.
- Dobaria, A., Bailey, J. M., Mohan, S., Klavon, T. G., Medrano, J. R., Jaffe, J. B., & Lombardi, D. (2021, August). Students' scientific evaluations of astronomy concepts [Poster Presentation]. EARLI 2021—the 19th Biennial EARLI Conference, Gothenburg, Sweden.

- Crnosija, N.\*, **Medrano, J.**\*, Prather, R.W., & Payne-Sturges, D., (2021, August). Bridging the environment and neurodevelopment for children's health study: An overview [Poster Presentation]. Eighth Annual Public Health Research, College Park, MD.
- Mohan, S., **Medrano, J.**, Lombardi, D., & Jaffe, J. (2021, August). Students' evaluations, plausibility perceptions, and knowledge shifts about climate change and water resources [Pre-recorded Poster Presentation]. 2021 Annual Meeting of the American Educational Research Association, San Diego, CA.
- Medrano, J. & Prather, R. W. (2021, April). Consistency of individual differences across number line tasks [Poster Presentation]. Society for Research in Child Development 2021 Virtual Biennial Meeting.
- Jaffe, J.,\* Medrano, J.,\* & Lombardi, D. (2020, August). Promoting scientific plausibility and knowledge shifts through modeled evaluation activities [Poster Presentation]. American Psychological Association Convention 2020, Washington, D.C. \*\*\* Poster Selected for Presidential Poster Session
- **Medrano, J.** & Prather, R. W. (2020, June). Cognitive, behavioral, and affective influences of mathematical achievement [Conference Canceled]. 2020 Mathematical Cognition and Learning Society Conference, Dublin, Ireland.
- Medrano, J.,\* Jaffe, J.,\* & Lombardi, D. (2020, April). Does the evidence support the model? Examining the effectiveness of two instructional scaffolds in science classrooms [Conference Canceled]. 30th Annual Meeting of the Society for Text and Discourse, Atlanta, GA.
- Medrano, J. & Jirout, J. (2019, October). The role of relative magnitude reasoning in space-math relations [Poster Presentation]. Bi-ennial Cognitive Development Society Conference 2019, Louisville, KY.
- Medrano, J. & Jirout, J. (2019, March). Thinking relatively: The role of magnitude in mathematical and spatial thinking [Poster Presentation]. 10<sup>th</sup> Curry Research Conference, Charlottesville, VA.
- \*Presenters contributed equally.
- <sup>U</sup> Undergraduate Mentee

# DEPARTMENTAL TALKS AND LECTURES

- Medrano, J. (2024, May). Inhibitory control and mathematical thinking and learning: What, when, and how. University of Pittsburgh, Kid's Thinking Lab.
- **Medrano, J.** (2024, April). Examining specific cognitive processes during arithmetic: The roles of inhibitory control and working memory. University of Notre Dame, Cognition, Brain, and Behavior Group Brown Bag.
- **Medrano, J.** (2023, October). Examining how numerical and non-numerical inhibitory control contribute to arithmetic skills: A path analytical approach. Kent State University Cognitive Brown Bag.

## **RESEARCH ASSISTANTSHIPS**

**Graduate Research Assistant**, Cognition and Development Lab, 2019-2023 University of Maryland, College Park, PI: Dr. Richard W. Prather

- Projects: Bridging the Environment and Neurodevelopment for Children's Health; Accurate, Precise, Equitable and Useful Models of the State of the Learner; Maryland Order of Operations (MOOS)
- Duties: Manuscript writing, designing research studies and procedures, training and mentoring research assistants, running participants on behavioral and EEG tasks, conducting data analysis using R and programming using MATLAB

Graduate Research Assistant, Science Learning Research Group, 2019-2020

University of Maryland, College Park, PI: Dr. Doug Lombardi

Projects: Model-Evidence-Link (MEL) Project, IC+MET

Duties: Manuscript writing, data entry, data analysis (using R, SPSS, and warpPLS), conference presentations, lab meetings, website design and maintenance

**Graduate Research Assistant**, Research in Education and Learning Lab, 2018-2019 University of Virginia, PI: Dr. Jamie Jirout

Projects: Spatial learning as play, Role of magnitude in math and spatial thinking Duties: Data collection, data analysis and interpretation using SPSS, literature reviews, designing and running experiments using OpenSesame, conference presentations

### Research Assistant, Cognitive Development Lab, 2014-2016

The Ohio State University, PI: Dr. Vladimir Sloutsky

Project: Development of categorization during inductive learning

Duties: Running participants in eye-tracking and behavioral experiments using EyeLink and PsychoPy, programming in experiments, reviewing literature, scheduling graduate researchers and undergraduate research assistants in designated preschools and daycare centers

### Research Assistant Intern, Berkeley Early Learning Lab, 2015

University of California, Berkeley, PI: Dr. Fei Xu

Projects: Development of nonsymbolic probability judgments

Duties: Participant recruitment, running child participants on campus and in a museum, learning programming tools like MATLAB and BlendR, attending weekly meetings

## **TEACHING EXPERIENCE**

### **Kent State University**

**Guest Lecturer**, Child Psychology (1 section, 145 students), Instructor: Dr. Dana Miller-Cotto, Spring 2024

Lecture Title: "Early Adolescence: Physical and Cognitive Development"

**Guest Lecturer**, Children's Thinking (1 section, 40 students), Instructor: Dr. Dana Miller-Cotto, Fall 2023

Lecture Title: "Cognitive Development: Development of Academic Skills"

### University of Maryland

Main Instructor, Research Methods in Human Development (1 section, 40 students), Spring 2023

**Teaching Assistant**, Research Methods in Human Development (2 sections, 80 students), Instructor: Dr. Richard Prather, Fall 2022

**Guest Lecturer**, Human Development Through The Life Span (1 section, 40 students), Instructor: Rachel Ghosh, Fall 2021

Lecture Title: "Middle Childhood: Physical and Cognitive Development"

## SERVICE

## **Ad-Hoc Journal Reviewing**

Environmental Research Educational Psychology Review Infant Behavior and Development Journal of Contemporary Educational Psychology

## Service to the Field

Reviewer, American Psychological Association Conference, Division 7, 2024
Reviewer, Mathematical Cognition and Learning Society Conference, 2021-Present
Volunteer for Mathematical Cognition and Learning Society Conference, 2024
Panelist, How to Find, Obtain, and Thrive in a Postdoctoral Position, Badar Kauffman Conference, Kent, OH, 2024
Feedback Reviewer, Application Statement Feedback Program, 2023 - Present
Editor, Application Statement Feedback Program, 2022 - Present
Symposium Moderator, Curry Research Conference, University of Virginia, 2019
Editor, Journal of Undergraduate Research at Ohio State (JUROS), 2015-2016

## Service to the Department and University

Graduate School Field Committee for Developmental Science
Graduate Student Liaison, Executive Committee, 2021-2023
Human Development Graduate Student Organization
President, 2021-2022
Professional Development Committee Co-Chair, 2019-2021
Social Committee Co-Chair, 2019-2020
Graduate Student Government, University of Maryland
Department Student Representative / Assembly Member, 2020-2021
Graduate Research Appreciation Day Committee Member, 2020-2021

## **Outreach Experience**

Children's Museum, Charlottesville, VA, 2018-2019. Language Sciences Research Lab at Center for Science and Industry (COSI), Columbus, OH, Spring 2014 Provided student assistance for the demonstration "Trick Sentences." https:// u.osu.edu/thebln/language-outreach/.

#### **Other Professional Experience**

Graduate Student Coordinator, Summer Undergraduate Research Program, University of Virginia, 2019 Administrative Assistant, T.C.P. World Academy, Cincinnati, OH, 2017-2018 Tutor/Corps Member, AmeriCorps/Ohio Math Corps, Cincinnati, OH, 2016-2017

## **PROFESSIONAL AFFILIATIONS**

American Psychological Association Division 7 - Developmental Psychology Division 15 - Educational Psychology Cognitive Development Society Math Learning and Cognition Society Society for Research in Child Development

## **MENTORSHIP ACTIVITIES**

Mathematical Learning and Cognition Society 2024-present Patrick Ehrman

#### Kent State University

2024-present Hannah Fender2024-present Amelia King2024-present Lauren Parrish2023-present Logan Ernst

## University of Maryland

2021Linus Ghanadan2019-2020Jasmine Williams2019-2020Divija Kambala