

# Molly Lewis

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## Education and Employment

Quantitative Researcher, 2023 – present, Facebook Research

Senior Research Scientist, 2022 – 2023, Alexa, Amazon

Research Scientist (Special Faculty), 2019 – 2022, Department of Psychology/Social and Decision Sciences, Carnegie Mellon University

Post-doctoral scholar, co-advised by James Evans (University of Chicago) and Gary Lupyan (University of Wisconsin-Madison), 2017 – 2019

Ph.D., Developmental Psychology, Stanford University, fall 2016

Advisor: Michael C. Frank

Committee: Noah Goodman, Ellen M. Markman, Hyowon Gweon, and Thomas Icard

Thesis title: “Conceptual complexity and the evolution of the lexicon”

Lab Coordinator, Communication and Language Lab (PI: Duane Watson), University of Illinois at Urbana-Champaign, 2009 – 2011

B.A., Linguistics, Reed College, May 2009

## Additional coursework

The Summer Institute in Computational Social Science, Princeton, New Jersey, summer 2017

Machine Learning Summer School, Tübingen, Germany, summer 2013

Graduate coursework, Psychology Department, University of Illinois at Urbana-Champaign, 2010

## Honors and Awards

Paula Menyuk Travel Award BUCLD (2015)

Cognitive Science Society Travel Award (2013)

NSF Graduate Research Fellowship, Honorable Mention (2013, 2012)

Commended for Excellence in Scholarship, Reed College (2009, 2008, 2007)

## Publications

### Peer-Reviewed Journal Articles

- Cao, A., **Lewis, M.**, Tsuji, S., Bergmann, C., Cristia, A., and Frank, M. C. (2024). Estimating age-related change in infants' linguistic and cognitive development using (meta-)meta-analysis. *Developmental Science*. <https://osf.io/preprints/psyarxiv/qd3cf.v1>
- Zettersten, M.\*, Cox, C.M.M.\*, Bergmann, C.\*, Tsui, A.S.M., Soderstrom, M., Mayor, J., Lundwall, R.A., **Lewis, M.**, Kosie, J.E., Kartushina, N., Fusaroli, R., Frank, M.C., Byers-Heinlein, K., Black, A.K., & Mathur, M.B. (2024). Evidence for infant-directed speech preference is consistent across large-scale, multi-site replication and meta-analysis. *Open Mind*, 8, 439-461. \*equal authorship
- Lewis, M.**, Cahill, A., Madnani, N. and Evans, J. (2023). Local similarity and global variability characterize the semantic space of human languages. *PNAS*. 120(51) e2300986120. <https://psyarxiv.com/f5bvp>
- Lewis, M.**, Mathur, M. B., VanderWeele, T. J., Frank, M. C. (2022). The puzzling relationship between multi-lab replications and meta-analyses of the rest of the literature. Commentary on Kvarven et al. (2019). *Royal Society Open Science*. <https://psyarxiv.com/pbrdk>
- Zettersten, M., Yurovsky, D., Xu, T. L., Uner, S., Tsui, A.S.T., Schneider, R. M., Saleh, A. N., Meylan, S. C., Marchman, V., Mankewitz, J., MacDonald, K., Long, B., **Lewis, M.**, Kachergis, G., Handa, K., deMayo, B., Carstensen, A., Braginsky, M., Boyce, V., Bhatt, N., Bergey, C. A., Frank, M.C. (2022). Peekbank: An open, large-scale repository for developmental eye-tracking data of children's word recognition. *Behavior Research Methods*.
- Lewis, M.**, Cooper Borkenhagen, M., Converse, E., Lupyan, G. and Seidenberg, M. S. (2021). What might books be teaching young children about gender? *Psychological Science*. <https://psyarxiv.com/ntgfe/>
- Cao, A. & **Lewis, M.** (2021). Quantifying the syntactic bootstrapping effect in verb learning: A meta-analytic synthesis. *Developmental Science*. <https://psyarxiv.com/x8ynm>
- Lewis, M.** & Lupyan, G. (2020). Gender stereotypes are reflected in the distributional structure of 25 languages. *Nature Human Behavior*, 4(10), 1021-1028. <https://psyarxiv.com/7qd3g>
- Perry, L., **Lewis, M.** & Lupyan, G. (2020). Shaping semantic networks with transcranial direct current stimulation. *Quarterly Journal of Experimental Psychology*, 73(11), 1891-1907. <https://osf.io/qm8yt/>
- Lewis, M.**, Cristiano, V., Lake, B. M., Kwan, T., Frank, M. C. (2020). The role of developmental change and linguistic experience in the mutual exclusivity effect. *Cognition*, 198, 104191. <https://psyarxiv.com/wsx3a>
- Lewis, M.**, Zettersten, M & Lupyan, G. (2019). Distributional semantics as a source of visual knowledge: Commentary on Kim, Elli, and Bedny (2019). *PNAS*, 116(39), 19237-19238. <https://psyarxiv.com/cau95>
- Lewis, M.** & Frank, M. C. (2018). Still suspicious: The suspicious coincidence effect revisited. *Psychological Science*, 29(12), 2039-2047. <https://psyarxiv.com/x6a2u>
- Bergmann, C., Tsuji, S., Piccinini, P., **Lewis, M.**, Braginsky, M., Frank, M. C. & Cristia, A. (2018). Assessing current practices in language acquisition research through meta-analyses. *Child Development*, 89, 1996-2009.
- Barner, D., Athanasopoulou, A., Chu, J., **Lewis, M.**, Marchand, E., Schneider, R. M., Frank, M. C. (2017).

- A one-year classroom-randomized trial of mental abacus instruction for first- and second-grade students. *Journal of Numerical Cognition*, 3(3), 540-558.
- Lupyan, G. & **Lewis, M.** (2017). From words-as-mappings to words-as-cues: The role of language in semantic knowledge. *Language, Cognition and Neuroscience*, 34(10), 1-19.
- Lewis, M.** & Frank, M. C. (2016). Understanding the effect of social context on learning: A replication of Xu and Tenenbaum (2007b). *Journal of Experimental Psychology: General*, 145(9), e72-e80.
- Lewis, M.** & Frank, M. C. (2016). Linguistic structure emerges through the interaction of memory constraints and communicative pressures. Commentary on M. Christiansen & N. Chater, The Now-or-Never Bottleneck: A Fundamental Constraint on Language. *Behavioral and Brain Sciences*, 39, 38-39.
- Lewis, M.** & Frank, M. C. (2016). The length of words reflects their conceptual complexity. *Cognition*, 153, 182-195.
- Frank, M. C., Sugarman, E., Horowitz, A. C., **Lewis, M. L.**, & Yurovsky, D. (2016). Using tablets to collect data from young children. *Journal of Cognition and Development*, 17(1), 1-17.
- Lewis, M.** & Watson, D. G. (2015). Effects of lexical semantics on acoustic prominence. *Language and Cognition*, 8, 1-21.

## Book Chapters

- Caliskan, A. & **Lewis, M.** (2021). Social biases in word embeddings and their relation to human cognition. <https://psyarxiv.com/d84kg>

## Peer-Reviewed Conference Proceedings

- Lewis, M.**, Balamurugan, A., Zheng, B. & Lupyan, G. (2021). Characterizing Variability in Shared Meaning through Millions of Sketches. *Proceedings of the 42nd Annual Meeting of the Cognitive Science Society*.
- Lewis, M.**, Colunga, E., & Lupyan, G. (2021). Superordinate Word Knowledge Predicts Longitudinal Vocabulary Growth. *Proceedings of the 42nd Annual Meeting of the Cognitive Science Society*.
- Lewis, M.** & Lupyan, G. (2018). Language use shapes cultural norms: Large scale evidence from gender. *Proceedings of the 39th Annual Meeting of the Cognitive Science Society*.
- Lewis, M.** & Frank, M. C. (2016). Linguistic niches emerge from pressures at multiple timescales. *Proceedings of the 38th Annual Meeting of the Cognitive Science Society*.
- Frank, M. C., **Lewis, M.**, & MacDonald, K. (2016). A performance model for early word learning. *Proceedings of the 38th Annual Meeting of the Cognitive Science Society*.
- Lewis, M.** & Frank M. C. (2016). Learnability pressures influence the encoding of information density In the lexicon. In S.G. Roberts, C. Cuskley, L. McCrohon, L. Barcelo-Coblijn, O. Feher & T. Verhoef (eds.) *The Evolution of Language: Proceedings of the 11th International Conference*.
- Lewis, M.** & Frank, M. C. (2015). Conceptual complexity and the evolution of the lexicon. *Proceedings of the 37th Annual Meeting of the Cognitive Science Society*.
- Lewis, M.**, Sugarman, E. & Frank, M. C. (2014). The structure of the lexicon reflects principles of communication. *Proceedings of the 36th Annual Meeting of the Cognitive Science Society*.
- Lewis, M.** & Frank, M. C. (2013). Modeling disambiguation in word learning via multiple probabilistic constraints. *Proceedings of the 35th Annual Meeting of the Cognitive Science Society*.

- Lewis, M.** & Frank, M. (2013). An integrated model of concept learning and word-concept mapping. *Proceedings of the 35th Annual Meeting of the Cognitive Science Society.*

## Blog Posts

- Lewis, M.** (2022). Why Responsible AI needs Psychology. <https://medium.com/@mollyllewis/why-responsible-ai-needs-psychology-4fabe9a923e0>
- Lewis, M.** (2019). What you say shapes what I say: Building a causal theory from wild data. *Psychonomic Society*, Big Data Series, <https://featuredcontent.psychonomic.org/psbigdata-what-you-say-shapes-what-i-say-building-a-causal-theory-from-wild-data/>

## Presentations

### Conference Presentations

- Lewis, M.**, Colunga, E., & Lupyan, G. (July, 2021). Superordinate Word Knowledge Predicts Longitudinal Vocabulary Growth. Talk presented at Annual Meeting of the Cognitive Science Society.
- Lewis, M.**, Balamurugan, A., Zheng, B. & Lupyan, G. (July, 2021). Characterizing Variability in Shared Meaning through Millions of Sketches. Poster presented at Annual Meeting of the Cognitive Science Society.
- Lewis, M.** & Lupyan, G. (February, 2021). What are we learning from language? Associations between gender biases and distributional statistics in 25 languages. Talk presented as part of symposium on “Macro-Level Social Psychology: New Approaches to Studying Attitudes and Stereotypes” at the annual SPSP conference.
- Lewis, M.**, Bergmann, C., Zettersten, M., Soderstrom, M., Tsui, A., Mayor, J., Lundwall, R., Kosie, J., Kartushina, N., Fusaroli, R., Frank, M., Byers-Heinlein, K., Black, A., Mathur, M. (January, 2021). Why do large-scale replications and meta-analyses diverge? A case study of infant-directed speech preference. Talk presented at Berkeley Initiative for Transparency in the Social Sciences (BITSS).
- Lewis, M.** & Lupyan, G. (May, 2020). What are we learning from language? Gender stereotypes are reflected in the distributional structure of 25 languages. Talk presented at the APS annual convention, Chicago, Illinois. \*cancelled due to pandemic
- Lewis, M.** & Evans, J. (July, 2018). The topography of variability in cross-linguistic semantics. Talk presented at the 4th Annual International Conference on Computational Social Science, Evanston, Illinois.
- Lewis, M.** & Lupyan, G. (April, 2018). What 50 million drawings can tell us about shared meaning. Poster presented at the 12th International Conference of the Evolution of Language, Toruń, Poland.
- Lewis, M.**, Braginsky, M., Tsuji, S., Bergmann, C., Piccinini, P., Cristia, A. & Frank, M. C. (July, 2017). A quantitative synthesis of early language acquisition using meta-analysis. Poster presented at Beyond the Lab: Using Big Data to Discover Principles of Cognition Conferences, Madison, Wisconsin.
- Lewis, M.** & Frank, M. C. (2016, August). Linguistic niches emerge from pressures at multiple timescales. Poster presented at the 38th Annual Meeting of the Cognitive Science Society, Philadelphia, Pennsylvania.

- Tsuji, S., **Lewis, M.**, Bergmann, C., Cristia, A., Braginsky, M., Piccinini, P., Frank, M. C. & Cristia, A. (2016, May). MetaLab: Supporting Power Analysis and Experimental Planning in Developmental Research. Poster presented at the 2016 ICIS Conference, New Orleans, Louisiana.
- Lewis, M.** & Frank M. C. (2016, March). Learnability pressures influence the encoding of information density in the lexicon. Talk presented at the 11th International Conference of the Evolution of Language, New Orleans, Louisiana.
- Tsuji, S., Bergmann, C., Cristia, A., **Lewis, M.**, Braginsky, M., & Frank, M. C. (2016, January). MetaLab: Power Analysis and Experimental Planning in Developmental Research Made Easy. Poster presented at the 2015 Budapest CEU Conference on Cognitive Development, Budapest, Hungary.
- Lewis, M.**, Braginsky, M., Bergmann, C., Tsuji, S., Cristia, A. & Frank, M. C. (2015, November). MetaLab: A tool for power analysis and experimental planning in developmental research. Talk presented at the 40th Annual Meeting of the Boston University Child Language Development, Boston, Massachusetts.
- Lewis, M.** & Frank, M. C. (2015, July). Conceptual complexity and the evolution of the lexicon. Talk presented at the 37th Annual Meeting of the Cognitive Science Society, Pasadena, California.
- Lewis, M.** & Frank, M. C. (2015, March). A meta-analytic approach to understanding the disambiguation effect. Poster presented at the 2015 Biennial Meeting of the Society for Research in Child Development, Philadelphia, Pennsylvania.
- Lewis, M.** & Frank, M. C. (2014, July). The structure of the lexicon reflects principles of communication. Talk presented at the 36th Annual Meeting of the Cognitive Science Society, Quebec City, Canada.
- Lewis, M.** & Frank, M. C. (2014, June). Understanding the psychological sources of communicative behavior. Talk presented at the 40th Annual Meeting of the Society for Philosophy and Psychology, Vancouver, Canada.
- Lewis, M.** (2013, September). Modeling disambiguation in word learning via multiple probabilistic constraints. Poster presented at the Machine Learning Summer School, Tübingen, Germany.
- Lewis, M.** & Frank, M. (2013, August). An integrated model of concept learning and word-concept mapping. Talk presented at the 35th Annual Meeting of the Cognitive Science Society, Berlin, Germany.
- Lewis, M.** & Frank, M. C. (2013, August). Modeling disambiguation in word learning via multiple probabilistic constraints. Talk presented at the 35th Annual Meeting of the Cognitive Science Society, Berlin, Germany.
- Lewis, M.** & Watson, D. G. (2013, July). Say it like you mean it: Lexical meaning influences prosody. Talk presented at the Embodied and Situated Language Processing Conference, Potsdam, Germany.
- Lewis, M.** & Watson, D. (2011, September). Say it like you mean it: Lexical meaning influences prosody. Talk presented at the Annual Meeting of Architectures and Mechanisms for Language Processing, Paris, France.

## Invited Talks

- “Learning biases from structure in human language.” (2020, September). Talk presented at Human Computer Interaction Institute Seminar, Carnegie Mellon University, Pittsburgh, PA.
- “Gender stereotypes are reflected in the distributional structure of 25 languages.” (2020, May). Talk presented at Computational Social Science Workshop, Chicago, Illinois.

- “Language reflects the mind, but does it also shape it?” (2020, April). Talk presented at SFI working group, “Language as a Window into Human Minds”, Santa Fe, New Mexico.
- “Conceptual Complexity and the Evolution of the Lexicon.” (2019, September). Reading and Language Group Talk Series, Learning Research and Development Center, University of Pittsburgh.
- “Bridging from Human Cognition to Social Structures.” (2019, February). Department of Psychology, Carnegie Mellon University.
- “Bridging from Human Cognition to Social Structures.” (2019, February). Department of Psychology, University of California-San Diego.
- “Bridging from Human Cognition to Social Structures.” (2019, January). Department of Cognitive Science, University of California-Merced.
- “Bridging from Human Cognition to Social Structures.” (2019, January). Department of Psychology, Syracuse University.
- “Bridging from Human Cognition to Social Structures.” (2019, January). Department of Psychology, University of Chicago.
- “Second-language learner text as a window into cross-linguistic semantics.” (2018, January). 5th Science of Science Meeting, University of Chicago, Northwestern University.
- “A Quantitative Synthesis of Language Development Using Meta-Analysis.” (2017, November). Developmental Brownbag, Department of Psychology, University of Chicago.
- “A Quantitative Synthesis of Language Development Using Meta-Analysis.” (2016, September). Cognitive and Developmental Brownbag, Department of Psychology, University of Wisconsin-Madison.
- “A Quantitative Synthesis of Language Development Using Meta-Analysis.” (2016, June). Developmental Brownbag, Department of Psychology, Stanford University.
- “Cognitive mechanisms shape linguistic structure.” (2016, March). Knowledge Lab, University of Chicago.
- “The role of communicative pressures in shaping the lexicon.” (2014, December). Laboratoire de Sciences Cognitives et Psycholinguistique, ENS, Paris, France.
- “The length of words reflects their cognitive complexity.” (2015, February). Cognitive-Neuroscience Talk Series, Department of Psychology, Stanford University.
- “The length of words reflects cognitive complexity.” (2014, October). Lightning talk presented at the Stanford Psychology Colloquium Series, Department of Psychology, Stanford University.
- “The structure of the lexicon reflects principles of communication.” (2014, April). Developmental Brownbag, Department of Psychology, Stanford University.
- “The structure of the lexicon reflects principles of communication.” (2014, February). Cognitive Talk Series, Department of Psychology, Stanford University.
- “Multiple routes to solving the mapping problem.” (2013, August). Informatics Group, University of Edinburgh.
- “Modeling disambiguation in word learning via multiple probabilistic constraints.” (2013, May). Stanford-Berkeley-Santa Cruz Developmental Psychology Conference, UC Berkeley.
- “An integrative model for word-concept mapping.” (2012, September). Lightning talk presented at Bay Area Bayesians, UC Berkeley.
- “Formalizing the problem of reference.” (2012, June). Developmental Brownbag Series, Department of Psychology, Stanford University.

“Saying it like you mean it: Evidence for sound symbolism in language production.” (2010, November).  
Cognitive Brownbag Series, Department of Psychology, University of Illinois at Urbana-Champaign.

## Selected Media Coverage

“How Dozens of Languages Help Build Gender Stereotypes” (2020, August). *Scientific American*. [link]  
 “New Study Reveals 25 Most Gender-Biased Languages And Career Impact” (2020, August). *Forbes*. [link]  
 “These are the most gender-biased languages in the world (hint: English has a problem)” (2020, August).  
*Fast Company*. [link]  
 “What Do Children’s Books Teach Kids About Gender?” (2021, December). *The Capital Times*. [link]  
 “Children’s beliefs about gender may be influenced by the books they read, study finds” (2021, December).  
*The Kansas City Star*. [link]

## Professional Activities and Service

Cognitive Science Society awards committee, 2021  
 Fulbright committee, Carnegie Mellon University, 2020  
 MetaLab Governing Board, 2014 - present  
 Graduate Admissions Committee, Student Representative, Stanford University, 2014-2015  
 Talk Series Organizer, Developmental Talk Series, Stanford University, 2013-2014  
 Faculty Search Committee, Student Representative, Stanford University, 2012-2013  
 Peer reviewer, Proceedings of the Annual Meeting of the Cognitive Science Society, 2012-2017; Evolution of Language Evolution Conference, 2017  
 Ad-hoc peer reviewer, *Psychonomic Bulletin & Review*, *PNAS*, *Psychological Review*, *Cognition*, *Behavioral Research Methods*, *Journal of the American Medical Association*, *Language and Cognition*, *Cognitive Science*, *American Psychologist*

## Teaching

Primary Instructor, Modern Research Methods: Cumulative Science, Big Data and Meta-Analysis, Carnegie Mellon University, spring 2020, fall 2021  
 (Course website: <https://cumulativescience.netlify.com/>)  
 Primary Instructor (with Eleanor Chestnut and Ann Nordmeyer), Language and Thought, Stanford University, summer 2014  
 Lead workshop on the meta-analytic method, workshop at the Annual Cognitive Science Conference, “Meta-Analytic Methods for Cognitive Scientists” (Co-instructors: Sho Tsuji and Christina Bergmann), Philadelphia, Pennsylvania, August 2016  
 Lead workshop on the meta-analytic method, CSLI, Stanford University, summer 2015  
 Guest Lecture, Introduction to the Meta-Analytic Method, Graduate Research Methods, Carnegie Mellon University, fall 2020

Guest Lecture, Language Acquisition, University of Wisconsin-Madison, fall 2018

Guest Lecture, Introduction to Developmental Psychology, Stanford University (Instructor: Michael C. Frank), spring 2014

Head Teaching Assistant (with Kody Manke), Introduction to Statistical Methods (Instructor: Ewart Thomas), Stanford University, winter 2015

Teaching Assistant, Introduction to Statistical Methods (Instructor: Ewart Thomas), Stanford University, winter 2013

Teaching Assistant, Introduction to Developmental Psychology (Instructor: Michael C. Frank), Stanford University, fall 2012, spring 2014

Teaching Assistant, Introduction to Symbolic Systems (Instructors: Dan Lassiter and Thomas Icard), Stanford University, fall 2015

## Mentorship

Anjie Cao (Carnegie Mellon University; undergraduate RA, summer 2020)

Anjali Balamurugan (Carnegie Mellon University; undergraduate RA, summer/fall 2020)

Jailyn Zabala (Carnegie Mellon University; undergraduate RA, summer 2020)

Bin Zheng (Carnegie Mellon University; undergraduate RA, summer/fall 2020)

Sarah Chen (Carnegie Mellon University; undergraduate RA, summer 2020)

Victoria Shiau (Carnegie Mellon University; undergraduate RA, summer 2020)

Allison Durkin (Yale University, CSLI intern; summer 2015)

Andres Camperi (Stanford University, CSLI intern; summer 2015)

Marlene Ade (Raising Interest in Science and Engineering program; summer 2015)

Ben Morris (Reed College, CSLI intern; summer 2014)

Elise Sugarman (Stanford University, undergraduate thesis advisor; 2013-2014)

Liza Benabbas (Raising Interest in Science and Engineering program; summer 2013)

Mia Kirkendoll (Raising Interest in Science and Engineering program; summer 2012)