

Tyler Zarus Knowlton

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Current Address

Linguistics and Cognitive Science
Ewing Hall, 4th Floor
Newark, DE 19716

Contact Information

✉ tzk@udel.edu
🏠 tylerknowlton.com
☎ (856) 287-6942

Academic Appointments

Postdoctoral Researcher Department of Linguistics and Cognitive Science <i>Mentor:</i> Alon Hafri University of Delaware , Newark, DE	2024-
Postdoctoral Research Fellow Mind Center for Outreach, Research, and Education (MindCORE) <i>Mentors:</i> Anna Papafragou , John Trueswell , and Florian Schwarz University of Pennsylvania , Philadelphia, PA	2021-24

Education and Training

Ph.D. in Linguistics <i>Thesis:</i> The psycho-logic of universal quantifiers <i>Mentors:</i> Jeffrey Lidz and Paul Pietroski University of Maryland , College Park, MD	2016-21
Lab Manager, Vision and Cognition Lab Department of Psychological & Brain Sciences <i>Mentor:</i> Justin Halberda Johns Hopkins University , Baltimore, MD	2015-16
B.A. in Cognitive Science (with honors) Minors in Linguistics, Philosophy, and Psychology Johns Hopkins University , Baltimore, MD	2011-15

Grants and Fellowships

NSF Doctoral Dissertation Improvement Grant , “Doctoral Dissertation Research: The mental representation and acquisition of the universal quantifiers” (NSF #BCS-2017525) (with Jeffrey Lidz) \$14,994.00	2020
Jacob K. Goldhaber Travel Grant University of Maryland	2018
Fellow, NSF-NRT Training Program , “NRT-DESE: Flexibility in Language Processes and Technology: Human- and Global-Scale” (NRT #1449815)	2017
Provost’s Undergraduate Research Award Johns Hopkins University	2014

Honors and Awards

The Philosopher's Annual "10 Best Articles of the Year" selection Knowlton et al. (2023) <i>Psycholinguistic evidence for restricted quantification</i>	2024
Graduate Student Service Award University of Maryland, College of Arts and Humanities	2020
Howard Lasnik Award for Distinguished Teaching by a Graduate Student University of Maryland, Linguistics Department	2020
Jerrold J. Katz Young Scholar Award CUNY Conference on Human Sentence Processing	2019
Phi Beta Kappa Johns Hopkins University	2015

Publications

Book

Lidz, J. & **Knowlton, T.** (under review) *A course in first language acquisition*. Oxford University Press.

Refereed Journal Articles (mentees underlined)

Knowlton, T., Ünal, E., & Papafragou, A. (invited) Conceptual and linguistic representations. *Annual Review of Developmental Psychology*.

Ongchoco, J., **Knowlton, T.**, & Papafragou, A. (under review) Language shifts the representation of auditory objects. *Cognition*.

Knowlton, T., Trueswell, J., & Papafragou, A. (under review) Non-conservative quantifiers are unlearnable. *Language*.

Perkins, L., **Knowlton, T.**, Williams, A., & Lidz, J. (2024) *Thematic content, not number matching, drives syntactic bootstrapping*. *Language Learning and Development*.

Odic, D., **Knowlton, T.**, Wellwood, A., Pietroski, P., Lidz, J., & Halberda, J. (2024) *Observers efficiently extract the min and max element in perceptual magnitudes sets: evidence for a bipartite format*. *Psychological Science*.

Knowlton, T., Halberda, J., Pietroski, P., & Lidz, J. (2023) *Individuals versus ensembles and "each" versus "every": linguistic framing affects performance in a change detection task*. *Glossa Psycholinguistics*.

Knowlton, T., Pietroski, P., Williams, A., Halberda, J., & Lidz, J. (2023) *Psycholinguistic evidence for restricted quantification*. *Natural Language Semantics*.

Knowlton, T., Trueswell, J., & Papafragou, A. (2023) Keeping quantifier meaning in mind: connecting semantics, cognition, and pragmatics. *Cognitive Psychology*.

Knowlton, T., Pietroski, P., Halberda, J., & Lidz, J. (2022) The mental representation of universal quantifiers. *Linguistics and Philosophy*.

Knowlton, T., Hunter, T., Odic, D., Wellwood, A., Halberda, J., Pietroski, P., & Lidz, J. (2021) Linguistic meanings as cognitive instructions. *Annals of the New York Academy of Sciences*.

Refereed Conference Proceedings (mentees underlined)

Knowlton, T., Trueswell, J., & Papafragou, A. (forthcoming) The strength of conservativity: evidence from learnability experiments. *Proceedings of the Linguistic Society of America*.

Huang, S.-Z., **Knowlton, T.**, & Schwarz, F. (2024) Cross-linguistic comparisons on distributive universal quantification: *each* vs. *every* vs. *mei*. *Proceedings of the Linguistic Society of America*.

Knowlton, T. & Schwarz, F. (2024) *Every* provides an implicit comparison class when *each* does not. *Proceedings of the 47th Annual Penn Linguistics Conference*.

Onghoco, J., **Knowlton, T.**, & Papafragou, A. (2023) Language shifts the representation of sounds in time: from auditory individuals to auditory ensembles. *Proceedings of the Annual Meeting of the Cognitive Science Society*.

Knowlton, T., Trueswell, J., & Papafragou, A. (2022) New evidence for the unlearnability of non-conservative quantifiers. *Proceedings of the 23rd Amsterdam Colloquium*.

Knowlton, T., Trueswell, J., & Papafragou, A. (2022) A mentalistic semantics explains “each” and “every” quantifier use. *Proceedings of the Annual Meeting of the Cognitive Science Society*.

Knowlton, T. & Gomes, V. (2022) Linguistic and non-linguistic cues to acquiring the strong distributivity of *each*. *Proceedings of the Linguistic Society of America*.

Knowlton, T. & Lidz, J. (2021) Genericity signals the difference between *each* and *every* in child-directed speech. *Proceedings of the 45th annual Boston University Conference on Language Development*.

Knowlton, T., Pietroski, P., Williams, A., Halberda, J., & Lidz, J. (2021) Determiners are “conservative” because their meanings are not relations: evidence from verification. *Proceedings of Semantics and Linguistic Theory* 30.

Dissertation

Knowlton, T. (2021) *The psycho-logic of universal quantifiers*. University of Maryland.

Volumes Edited

Knowlton, T., Schwarz, F., & Papafragou, A. (Eds.) (2025) *Proceedings of the third Experiments in Linguistic Meaning (ELM 3)*. Linguistic Society of America.

Knowlton, T., Schwarz, F., & Papafragou, A. (Eds.) (2023) *Proceedings of the second Experiments in Linguistic Meaning (ELM 2)*. Linguistic Society of America.

Presentations

Invited Talks

Title TBA.

Mayfest 2025 - Constraints on Meaning, University of Maryland. May, 2025

What natural language meanings can tell us about natural logic's contents.

Logic Colloquium, University of Connecticut. February, 2025

Learnability and linguistic meanings: the case of conservativity.

Cognitive Development Center Seminar Series, Central European University. May, 2024

Universal quantifiers: logically equivalent, psychologically distinct.

Linguistics & Cognitive Science Colloquium, University of Delaware. December, 2023

Infant Mind & Cognition Lab (PI: Nicolò Cesana-Arlotti), Yale University. October, 2023

Universal quantifiers, objects, and ensembles: a case study in psychosemantics.

19th Workshop on Syntax, Semantics, and Phonology, Nantes Université. Sept., 2023

The poverty of the stimulus in the animal kingdom (humans included).

19th Workshop on Syntax, Semantics, and Phonology, Nantes Université. Sept., 2023

Different determiners invite different ways of restricting and representing the domain.

The New York Philosophy of Language Workshop, New York University. April, 2023

What conservativity tells us about Universal Grammar.

Linguistics Colloquium, University of Maryland. February, 2023

Non-conservative quantifiers are unlearnable (and what that means for semantic theory).

The Psycholinguistics Workshop, University of Massachusetts Amherst. October, 2022

Every universal is first-orderizable, but only "each" is first-orderized.

Cognitive Semantics and Quantities Workshop, University of Amsterdam. May 2022

The psycho-logic of "each" and "every".

LingLangLunch, Brown University. November, 2021

- The psycho-logic of universal quantifiers.*
 Linguistic Meaning Lab (PI: Helena Aparicio), Cornell University. October, 2021
 Linguistics Colloquium, University of Southern California. March, 2021
- The psychological treatment of (universal) quantification.*
 Integrated Language Sciences & Technology Seminar, Univ. of Pennsylvania. Nov., 2019
- Are natural language quantifiers first- or second-order?*
 McDonnell Network Focused Workshop on The Development of Set and
 Quantifier Representations, Johns Hopkins University. May, 2018

Conference Talks

- Knowlton, T.**, Trueswell, J., & Papafragou, A. (2025) *The strength of conservativity: evidence from learnability experiments.* Linguistic Society of America (LSA) Annual Meeting, Philadelphia, PA.
- Knowlton, T.**, Trueswell, J., & Papafragou, A. (2024) *Conservativity, learnability, and grammatical architecture.* Workshop on “Explaining Semantic Universals”, The 9th Conference of the Scandinavian Association for Language and Cognition (SALC), Norwegian University of Science and Technology.
- Knowlton, T.** & Schwarz, F. (2023) *“Every” provides an implicit comparison class when “each” does not.* The 47th annual Penn Linguistics Conference (PLC), University of Pennsylvania.
- Knowlton, T.**, Trueswell, J., & Papafragou, A. (2023) *Non-conservative quantifiers are unlearnable.* Linguistic Society of America (LSA) Annual Meeting, Denver, CO.
- Knowlton, T.**, Trueswell, J., & Papafragou, A. (2022) *New evidence for the unlearnability of non-conservative quantifiers.* Workshop on “Biases in Language and Cognition”, 23rd Amsterdam Colloquium (AC), Amsterdam, Netherlands.
- Gomes, V., **Knowlton, T.**, Papafragou, A., & Trueswell, J. (2022) *Differentiating universal quantifiers by differentiating their domains.* Boston University Conference on Language Development (BUCLD) 47, Boston University.
- Knowlton, T.**, Trueswell, J., & Papafragou, A. (2022) *A mentalistic semantics explains “each” and “every” quantifier use.* 44th Annual Meeting of the Cognitive Science Society (CogSci), Toronto, Canada.
- Cesana-Arlotti, N., **Knowlton, T.**, Lidz, J., & Halberda, J. (2022) *Universal quantification without language? Ten-month-old infants represent the exhaustivity of a relation in visually presented events.* Symposium on The Language of Thought, 3rd Joint Conference of the Society for Philosophy and Psychology and the European Society of Philosophy and Psychology (SPP/ESPP), Milan, Italy.
- Cesana-Arlotti, N., **Knowlton, T.**, Lidz, J., & Halberda, J. (2022) *On the origins of universal quantification: 10-month-old infants represent the exhaustivity of multi-agent intentional actions.* XXIII International Congress of Infant Studies (ICIS) Biennial Congress, Ottawa, Canada.
- Knowlton, T.** & Gomes, V. (2022) *Linguistic and non-linguistic cues to acquiring the strong distributivity of “each”.* Linguistic Society of America (LSA) Annual Meeting, Washington, DC.
- Knowlton, T.**, Halberda, J., Pietroski, P., & Lidz, J. (2021) *Evaluating “each”- (but not “every”-) sentences encourages encoding individual properties.* 34th CUNY Conference on

Human Sentence Processing, University of Pennsylvania.

- Knowlton, T.** & Lidz, J. (2021) *Bootstrapping universal quantifiers: the role of genericity*. Linguistic Society of America (LSA) Annual Meeting, San Francisco, CA.
- Knowlton, T.** & Lidz, J. (2020) *Genericity signals the difference between “each” and “every” in child-directed speech*. Boston University Conference on Language Development (BUCLD) 45, Boston University.
- Knowlton, T.**, Pietroski, P., Williams, A., Halberda, J., & Lidz, J. (2020) *Memory for cardinality supports a non-relational account of conservativity*. Experiments in Linguistic Meaning (ELM) 1, University of Pennsylvania.
- Cesana-Arlotti, N., **Knowlton, T.**, Lidz, J., & Halberda, J. (2020) *An investigation of the origins of logical quantification: infants’ (and adults’) representations of exhaustivity in collective or individual complex actions*. Symposium on Learning ‘hard words’, XXII International Congress of Infant Studies (ICIS) Biennial Congress, Glasgow, Scotland.
- Knowlton, T.**, Pietroski, P., Williams, A., Halberda, J., & Lidz, J. (2020) *Conservative meanings with only one set: evidence from verification*. 33rd CUNY Conference on Human Sentence Processing, University of Massachusetts Amherst.
- Knowlton, T.**, Pietroski, P., Halberda, J., & Lidz, J. (2019) *The mental representation of universal quantifiers: evidence from verification*. 32nd CUNY Conference on Human Sentence Processing, University of Colorado Boulder.
- Knowlton, T.**, Halberda, J., Pietroski, P., & Lidz, J. (2018) *Acquiring the universal quantifiers: every part together or each part on its own?* Boston University Conference on Language Development (BUCLD) 43, Boston University.

Conference Posters and Lightning Talks (mentees underlined)

- Shah, M., **Knowlton, T.**, Halberda, J., Pietroski, P., & Lidz, J. (2025) *Uniformity of verification strategies within and across individuals: Predicting performance with “most”-sentences from performance with “more”-sentences*. 38th Annual Conference on Human Sentence Processing (HSP), University of Maryland.
- Fayyaz, M., Icard, T., **Knowlton, T.**, Lidz, J., Pietroski, P., Halberda, J., & Cesana-Arlotti, N. (2025) *Developmental foundational logical cognition: infants’ concept of antitonicity (Order-FLIP)*. Society for Research in Child Development (SRCD) Biennial Meeting, Minneapolis, MN.
- Fayyaz, M., Icard, T., **Knowlton, T.**, Lidz, J., Pietroski, P., Halberda, J., & Cesana-Arlotti, N. (2025) *Antitonicity (order-flip) as a foundational logical concept in infancy*. Budapest CEU Conference on Cognitive Development (BCCCD), Budapest, Hungary.
- Knowlton, T.**, Trueswell, J., & Papafragou, A. (2024) *(Im)possible determiners and their learnability*. Boston University Conference on Language Development (BUCLD) 49, Boston University.
- Knowlton, T.**, Trueswell, J., & Papafragou, A. (2024) *The strength of a universal*. 46th Annual Meeting of the Cognitive Science Society (CogSci), Rotterdam, Netherlands.
- Huang, S.-Z., **Knowlton, T.**, & Schwarz, F. (2024) *Cross-linguistic comparisons on distributive universal quantification: “each”/“every” vs. “mei”*. Linguistic Society of America (LSA) Annual Meeting, New York, NY.
- Onghcoco, J., **Knowlton, T.**, & Papafragou, A. (2023) *Language shifts the representation of sounds in time: from auditory individuals to auditory ensembles*. 45th Annual Meeting of

the Cognitive Science Society (CogSci), Sydney, Australia.

Knowlton, T. & Schwarz, F. (2023) *“Every” provides an implicit comparison class when “each” does not.* 36th Annual Conference on Human Sentence Processing (HSP), University of Pittsburgh.

Cesana-Arlotti, N., Icard, T., **Knowlton, T.**, Lidz, J., Pietroski, P., & Halberda, J. (2023) *The slower they swim, the faster they fly! Can preverbal infants learn antitonic functions?* Budapest CEU Conference on Cognitive Development (BCCCD), Budapest, Hungary.

Knowlton, T., Trueswell, J., & Papafragou, A. (2022) *Non-conservative quantifiers are unlearnable.* Boston University Conference on Language Development (BUCLD) 47, Boston University.

Knowlton, T., Trueswell, J., & Papafragou, A. (2022) *A psycho-semantic explanation of “each” and “every” quantifier use.* Experiments in Linguistic Meaning (ELM) 2, University of Pennsylvania.

Cesana-Arlotti, N., **Knowlton, T.**, Lidz, J., & Halberda, J. (2022) *Universal quantification without language? Ten-month-old infants represent the universality of visually presented properties.* Experiments in Linguistic Meaning (ELM) 2, University of Pennsylvania.

Knowlton, T., Trueswell, J., & Papafragou, A. (2022) *Psycho-semantic representations explain “each” and “every” quantifier use.* 35th Annual Conference on Human Sentence Processing (HSP), University of California, Santa Cruz.

Cesana-Arlotti, N., **Knowlton, T.**, Lidz, J., & Halberda, J. (2021) *An investigation of the origins of logical quantification: infants’ (and adults’) representations of exhaustivity in collective or individual complex actions.* The 6th Lancaster Conference on Infant and Early Child Development, Lancaster University.

Cesana-Arlotti, N., **Knowlton, T.**, Lidz, J., & Halberda, J. (2021) *An investigation of the origins of logical quantification: infants’ (and adults’) representations of exhaustivity in collective or individual complex actions.* Society for Philosophy and Psychology (SPP) 47th Annual Meeting, Princeton University.

Cesana-Arlotti, N., **Knowlton, T.**, Lidz, J., & Halberda, J. (2021) *Representing the exhaustivity of collective and individual actions: an investigation of universal quantification in adults and infants.* 12th Dubrovnik Conference on Cognitive Science, Virtual.

Knowlton, T., Pietroski, P., Williams, A., Halberda, J., & Lidz, J. (2020) *Determiners are ‘conservative’ because their meanings are not relations: evidence from verification.* Semantics and Linguistic Theory (SALT) 30, Cornell University.

Cesana-Arlotti, N., **Knowlton, T.**, Lidz, J., & Halberda, J. (2020) *An investigation of the origin of logical quantification: infants’ and adults’ representations of collective and distributive actions in complex visual scenes.* 42nd Annual Meeting of the Cognitive Science Society, Virtual.

Cesana-Arlotti, N., **Knowlton, T.**, Lidz, J., & Halberda, J. (2020) *Who’s chasing whom? Adults’ and infants’ engagement of quantificational concepts (“each” and “all”) when representing visual chasing events.* Vision Sciences Society (VSS) 20th Annual Meeting, Virtual.

Cesana-Arlotti, N., **Knowlton, T.**, Lidz, J., Pietroski, P., & Halberda, J. (2019) *Concepts of universal quantification (“each” and “all”) may support infant and adult understanding of collective and distributive actions.* Cognitive Development Society (CDS) 2019 Biennial Meeting, Louisville, KY.

Knowlton, T., Halberda, J., Pietroski, P., & Lidz, J. (2019) *A novel memory task reveals early understanding of quantifier meanings.* Society for Research in Child Development (SRCD) Biennial Meeting, Baltimore, MD.

- Knowlton, T.**, Pietroski, P., Halberda, J., & Lidz, J. (2019) *Representational format and universal quantifiers*. Linguistic Society of America (LSA) Annual Meeting, New York, NY.
- Perkins, L., **Knowlton, T.**, Williams, A., & Lidz, J. (2018) *Matching number vs. linking roles: using 3-participant scene percepts to understand infants' bootstrapping*. Boston University Conference on Language Development (BUCLD) 43, Boston, MA.
- Knowlton, T.**, Perkins, L., Williams, A., & Lidz, J. (2018) *Getting a grip on infants' event representations: participant number in TAKE and PICK-UP*. XXI International Congress of Infant Studies (ICIS) Biennial Congress, Philadelphia, PA.
- Knowlton, T.**, Wong, A., Halberda, J., Pietroski, P., & Lidz, J. (2018) *Different determiners, different algorithms: two majority quantifiers in Cantonese bias distinct verification strategies*. 31st CUNY Conference on Human Sentence Processing, University of California, Davis.
- Knowlton, T.**, Halberda, J., Pietroski, P., & Lidz, J. (2017) *Sentences, centers, and sets: set selection and the meanings of more and most*. Cognitive Development Society (CDS) Biennial Meeting, Portland, OR.
- Knowlton, T.**, Halberda, J., Pietroski, P., & Lidz, J. (2017) *Distinguishing first- from second-order specifications of each, every, and all*. Mid-Atlantic Colloquium of Studies in Meaning (MACSIM) 7, Georgetown University.
- Knowlton, T.**, Halberda, J., Pietroski, P., & Lidz, J. (2017) *Set selection and storage reflect differences in quantifier meanings*. McDonnell Network Plenary Workshop on "The Ontogenetic Origins of Combinatorial Thought", University of California, San Diego.
- Perkins, L., **Knowlton, T.**, Hirzel, M., Dudley, R., Williams, A., & Lidz, J. (2017) *Linguistic and conceptual structure in verb learning*. McDonnell Network Plenary Workshop on "The Ontogenetic Origins of Combinatorial Thought", University of California, San Diego.

Teaching

University of Delaware (*Instructor of Record*)

Introduction to Cognitive Science (~130 undergraduates)	Spring 2025
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University of Pennsylvania (*Instructor of Record*)

Language, Cognition, and Culture (10 undergraduates; 1 postgraduate)	Spring 2024
Cognition, Language, and Perception (15 graduate students & faculty)	Fall 2022

University of Maryland

Instructor of Record

Language and Thought (11 undergraduates)	Spring 2020
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Teaching Assistant

Grammar and Meaning (24 undergraduates)	Fall 2019
Child Language Acquisition (19 undergraduates)	Spring 2019

Language and Mind (50 undergraduates)

Fall 2018

Recitation/Section Instructor

Introductory Linguistics (30 undergraduates)

Spring 2018

Mentorship

University of Pennsylvania

Cognitive science independent study co-mentor

2022-23

- Supervised 2 undergraduate thesis projects
- Mentee J. Ongchoco won the 2023 Robert J. Glushko Outstanding Undergraduate Award in Cognitive Science and a Phi Beta Kappa Senior Thesis Award

MindCORE [Step-Ahead Mentorship Program](#)

2021-22

- Supervised 1 undergraduate student

University of Maryland

Undergraduate mentor, [Project on Children's Language Learning](#)

2018-21

- Supervised 7 undergraduate research assistants

High school summer intern mentor, [Project on Children's Language Learning](#)

2019

- Mentee S. Chervenak won “Best Paper in Behavioral Sciences” from the Washington Academy of Science for his presentation at the Blair Magnet School STEM Fair

Johns Hopkins University

Undergraduate mentor, [Vision and Cognition Lab](#)

2015-16

- Supervised 5 undergraduate research assistants

Academic Activities

Service

University of Pennsylvania

Organizing committee, [ELM 3](#) (Experiments in Linguistic Meaning)

2023-24

Admissions committee, [DivE In](#) (Diversity and Equity Initiative)
3rd Annual Mentorship Weekend

2023

Proceedings co-editor, [ELM](#) (Experiments in Linguistic Meaning)

2022-24

Volunteer, [The 9th MACSIM](#) (Mid-Atlantic Colloquium of Studies in Meaning)

2023

Student mentor, DivE In (Diversity and Equity Initiative) 2 nd Annual Mentorship Weekend	2022
Host, Behind the CV: Stories from Faculty	2022
MindCORE Outreach Committee	2021
Organizing committee, ELM 2 (Experiments in Linguistic Meaning)	2021-22

University of Maryland

Linguistics Colloquium Committee	2019-21
Organizing committee, Mayfest 2020: Hindsight (postponed due to COVID-19)	2019-20
Co-organizer, Developmental Science Workshop <i>Endless Possibilities: The Development of Possibility and Necessity in Cognition, Language, and Society</i>	2018-19
Chair, Language Science Outreach Committee	2018-19
Planning committee, Winter Storm 10 (graduate student skills workshop)	2017-18
Co-chair, Linguistics Graduate Student Association	2017-18
Career fair coordinator, Language Science Outreach Committee	2016-18
Planning committee, Winter Storm 9 (graduate student skills workshop)	2016-17
Organizing committee, SALT 27 (Semantics And Linguistic Theory)	2016-17

Ad Hoc Reviewing

Manuscripts

Analysis
 Cognitive Science
 Discourse Processes
 Erkenntnis
 First Language
 Glossa: A Journal of General Linguistics
 Journal of Memory and Language (×4)
 Journal of Pragmatics
 Journal of Semantics (×2)
 Language Learning and Development (×3)
 Natural Language Semantics
 PLOS One

Proposals

CRC Press Book Proposal
 National Science Foundation Doctoral Dissertation Research Improvement Grant

Conference Abstracts/Papers

Annual Conference on Human Sentence Processing
 Annual Meeting of the Cognitive Science Society
 Budapest CEU Conference on Cognitive Development

European Summer School in Logic, Language and Information
Experiments in Linguistic Meaning
Penn Linguistics Conference
Procedural and Computational Models of Semantic and Pragmatic Processes
Semantics and Linguistic Theory
Sinn und Bedeutung

Professional Memberships

Society for Human Sentence Processing
Cognitive Science Society
Society for Research in Child Development
International Congress of Infant Studies
Cognitive Development Society
Linguistic Society of America