

BIOGRAPHICAL SKETCH

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NAME: Smith, Linda B.

eRA COMMONS USER NAME (credential, e.g., agency login): smith4@indiana.edu

POSITION TITLE: Distinguished Professor Psychological and Brain Sciences

EDUCATION/TRAINING (*Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.*)

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
University of Wisconsin- Madison	B.S.	05/1973	Psychology
University of Pennsylvania	Ph.D.	09/1977	Cognitive Psychology

A. Personal Statement

For 40 years I have studied early perceptual, motor, and cognitive development with an emphasis on how these processes influence infants and toddlers learning of their first object names and object categories. My research program has been continuously funded since my first grant in 1978 (funded by NSF) by NIH and/or NSF since. I have published over 200 papers. Specifically relevant to this proposal is my program of research studying the role of sensory-motor development in visual attention and my recent research on ego-centric vision in infants and toddlers, the study of the development of visual object recognition. I am PI of an Institutional Training Grant (NICHD, 5 predoctoral lines, 3 post-doctoral lines now in year 22), and have successfully mentored 22 PhD graduate students and 12 post-doctoral trainees who now make significant contributions on their own to science.

B. Positions and Honors

Professor (1997), Distinguished Professor (2007) Psychological and Brain Sciences, Indiana University Bloomington. James McKeen Cattell Sabbatical Award, 1984, Research Career Development Award - NICHD, 1984-1989, Early Career Contribution, American Psychological Association, 1985, Lilly Faculty Open Fellowship, 1993-94, Tracy M. Sonneborn Award (Indiana University) 1997, Society of Experimental Psychologists, 2005, Fellow, American Psychological Society, 2006, Fellow, American Academy of Arts and Sciences, 2007, Fellow, Cognitive Science Society, 2008. 2013 APA Award for Distinguished Scientific Contributions. 2013 Rumelhart Prize, Cognitive Science Society, 2014 Henry R. Besch, Jr. Promotion of Excellence Award (Indiana University), and the William James Fellow Award from the American Psychological Society, 2016, Society of Experimental Psychologists, Norman Anderson Lifetime Achievement Award, March 2019.

I have served on the National Science Foundation, Memory & Cognitive Processes Panel, 1983-86, National Science Foundation, Advisory Committee for the Directorate for Biological, Behavioral and Social Sciences, 1989-1991, National Institute of Mental Health, Cognition, Emotion and Personality Panel, 1989-1993, Forum for Federal Research Management, 1992 – 1994, National Institutes of Health, Scientific Review Advisory Committee, 1997, National Institutes of Health, Study Section (LCOM), 2002- 2006, Reviewer Pioneer Grants, 2010, Early Investigator Awards, 2012, 2014, T32 review panel NICHD 2014, 2015, Advisory Board for the Directorate for Social, Behavioral and Economic Sciences, National Science Foundation, (2015-present), the Board of the James S. McDonnell foundation (2015- present), National Science Foundation Cyberlearning Panel (2019 – present).

C. Contributions to Science

1. My earliest contributions focused on a unified account of developmental differences in the development of selective attention, perceptual categorization and perceived similarity of multidimensional stimuli. The work culminated in a mathematical model of attention and discrimination that explained developmental changes as well as a larger pattern of phenomena in the adult literature understood under the framework of integral and separable dimensions. The theoretical framework continues to have relevance to fundamental problems in category learning, in the development of executive control and in the perception of number.

- a. Smith, L. B. (1989) A Model of Perceptual Classification in Children and Adults. *Psychological Review*, 96(1), 125-144. PMID: 2928416
- b. Colunga, E. & Smith, L. B. (2005) From the Lexicon to Expectations About Kinds: A Role for Associative Learning. *Psychological Review*, 112(2). PMID: 15783290
- c. Hanania, R. & Smith, L. B. (2009) Selective attention and attention switching. *Developmental Science*, 1-14. PMID: PMC2939469
- d. Cantrell, L. & Smith, L. B. (2013) Open questions and a proposal: A critical review of the evidence on infant numerical abilities. *Cognition*, 128(3), 331-352. PMID: PMC3708991

2. My second contribution emerged from this earlier work on perceptual classification (and is deeply informed by that work) but focused on how very early word learners were biased to use some dimensions over others when generalizing newly learned words. The phenomenon –sometimes known as the shape bias – suggests that children learn the regularities that underlie classes of categories (artifacts versus substances, for example) and then use these regularities to generalize the name of one learned instance to the whole category. The research –still ongoing – showed how the shape bias depended on word learning, how it supported future word learning, how it was delayed in children with language delay, and how it varied with the linguistic properties of the specific language being learned. My current research is focused on how the development of the shape bias depends on prior advances in visual object recognition, advances, which in turn depend on the visual experiences generated by object manipulation.

- a. Smith, L.B., Jones, S.S., Landau, B., Gershkoff-Stowe, L. & Samuelson, S. (2002) Early noun learning provides on-the-job training for attention *Psychological Science*, 13, 13-19. PMID: 11892773.
- b. Smith, L. B. (2003) Learning to Recognize Objects. *Psychological Science*, 14 (3)244- 251. PMID: 12741748.
- c. Smith, L. B. (2009). From fragments to geometric shape: Changes in visual object recognition between 18 and 24 months. *Current Directions in Psychological Science*, 18(5), 290-294. PMID: PMC2888029.
- d. Smith, L. B. & Jones, S. (2011) Symbolic play connects to language through visual object recognition. *Developmental Science*, 14, 1142-1149. PMID: PMC3482824.

3. A third contribution is in the domain of theory and developmental systems, of how development is multi-causal dependent on complex interactions across levels of analysis and over multiple time scales. This work is particularly relevant to the present proposal with its emphasis on the cascading consequences of sensory-motor abilities on cognitive development and attention

- a. Smith, L. B., Thelen, E., Titzer, R. & McLin, D. (1999) Knowing in the Context of Acting: The Task Dynamics of the A-Not-B Error. *Psychological Review*, 106(2,) 235-260. PMID: 10378013
- b. Smith, L. B. & Thelen, E. (2003) Development as a dynamic system. *Trends in Cognitive Science*, 7, 343-348. PMID: 12907229
- c. Samuelson, L., Smith, L. B., Perry, L. & Spencer, J. (2011) Grounding Word Learning in Space. *PLoS One* 6(12): e28095. PMID: PMC3237424.
- d. Byrge, L., Sporns, O. & Smith, L. B. (2014) Developmental process emerges from extended brain-body-behavior networks. *Trends in Cognitive Sciences*. PMID: PMC4112155.

4. A fourth contribution concerns statistical learning, how very young word learners may learn word-referent pairings by aggregating over individually ambiguous learning experiences.

- Smith, L. B. & Yu, C. (2008) Infants rapidly learn word-referent mappings via cross-situational statistics. *Cognition*, 106(3), 1558-1568. PMID: PMC21585449
- Yurovsky, D., Smith, L. B. & Yu, C. (2013) Statistical Word Learning at Scale: The Baby's View is Better. *Developmental Science*, 1-7. PMID: PMC4443688
- Yu, C. & Smith, L. B. (2012) Modeling Cross-Situational Word-Referent Learning: Prior Questions. *Psychological Review*, 119(1), 21-39. PMID: PMC3892274
- Smith, L. B., Suanda, S., & Yu, C. (2014) The unrealized promise of infant statistical word-referent learning. *Trends in Cognitive Sciences*. PMID: PMC4112155

5. The fifth contribution is the use of multimodal and dense real time measures to capture first-person – egocentric—visual experiences of the 3-dimensional world as they move and actively explore their world and interact with social partners. This work, using head cameras, head-mounted eye-trackers, and motion sensors has revealed that infant and toddler visual experiences are fundamentally different in their content and in their dynamics, in ways that play a critical role in visual attention, in learning about objects, in social interactions, and in object name learning.

- Smith, L. B., Yu, C., & Pereira, A. F. (2011) Not your mother's view: the dynamics of toddler visual experience. *Developmental Science*, 14:1, 9-17. PMID: PMC3050020
- Pereira, A., Smith, L. B. & Yu, C. (2014) A Bottom-up View of Toddler Word Learning. *Psychonomic Bulletin & Review*, 21, 178-185. PMID: PMC3883952.
- Clerkin, E. M., Hart, E., Rehg, J. M., Yu, C. & Smith, L. B. (2017) Real-World Visual Statistics and Infants' First-learned Object Names. *Philosophical Transactions of the Royal Society B*, 372. PMID: PMC5124080
- Yu, C., Suanda, S. H. & Smith, L. B. (2018) Infant sustained attention but not joint attention to objects at 9 months predicts vocabulary at 12 and 15 months. *Developmental Science*. PMID: 30255968

Complete List of Published Work in MyBibliography:

<https://www.ncbi.nlm.nih.gov/sites/myncbi/linda.smith.1/bibliography/41162872/public/?sort=date&direction=ascending>

D. Research Support

Ongoing Research Support

RO1 HD074601 06/01/2014 - 05/31/2019
 NIH/NICHD
 Sensorimotor Dynamics of Early Parent-Child Interactions Build Word Learning Skills
 Role: Co-Investigator

DRL-1621093 Smith (PI) 09/01/2016- 08/31/2020
 NSF
 Collaborative Research: Place Value as a System of Mapping
 Role: PI

Indiana University Smith (PI) 05/01/2017 to 04/30/2021
 Learning: Machines, Brains and Children
 Role: Lead of 8 member team

BCS-1730146 Smith (PI) 09/01/2017 – 8/31/2019
 NSF SBE
 CompCog: Collaborative Research: Learning Visuospatial Reasoning Skills from Experience

Role: PI

F32 HD090827

Smith (PI)

11/2018 – 10/2019

NIH-NICHD

Early understanding of multi-digit numbers through statistical learning paves the way for formal training of place value concepts

Role: PI

R01 HD093792

Yu (PI)

11/15/2017 – 11/14/2022

NICCHD

What you see is what you learn: Visual attention in statistical word learning

This research examines how young children use statistical information to learn word-object associations. The project focuses on analyzing eye movement patterns to understand the role of visual attention in early word learning.

Role: Co-Investigator