

BIOGRAPHICAL SKETCH

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NAME: Heidi M Feldman

eRA COMMONS USER NAME (credential, e.g., agency login): FELDMANHEIDI

POSITION TITLE: Professor of Pediatrics, Division of Developmental and Behavioral Pediatrics

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 Pennsylvania, Philadelphia, PA	BA	06/1970	Psychology
University of Pennsylvania, Philadelphia, PA	PhD	06/1975	DevPsychology
University of California, San Diego, CA	MD	06/1979	Medicine
University of California, San Diego, CA	Residency	06/1982	Pediatrics
Children's Hospital Boston, Boston, MA	Fellowship	06/1983	Ambulatory Pediatrics
Children's Hospital Boston, Boston, MA	Fellowship	06/1984	Child and Family Dev

Personal Statement

I trained first as a developmental psychologist and then as a developmental-behavioral pediatrician. Throughout my career, the focus of my research has been on children at risk for disorders of language, reading, and cognition. Since joining the faculty at Stanford, I have studied children born preterm, a population at risk for language and reading impairments related to perinatal injury to long-range white matter circuits in the brain. Participants in these studies span from adolescents to infants, demonstrating the breadth of my skills in assessing neurodevelopmental outcomes. The methods combine advanced neuroimaging techniques and behavioral data collection. In 9-16-year-old children born preterm (RO1-HD46500), we demonstrated group differences between children born preterm and at term in white matter metrics, assessed using diffusion MRI, and distinct patterns of association between white matter metrics and reading skills in the two groups. In subsequent longitudinal studies of children born preterm and at term from ages 6 to 8 years (RO1 HD069162) we extended the findings to predict which children would become good versus weak readers. In another NIH funded longitudinal study of children born preterm from 18-54 months (RO1 HD069150), we described the importance of the quantity and quality of child-directed speech in infancy and early language processing efficiency at age 18 months on language and non-verbal outcomes at 54 months of age.

I have also had long-standing interest in health services for children with developmental and behavioral disorders, including attention deficit hyperactivity disorder (ADHD). I was a member of the subcommittees of the American Academy of Pediatrics that prepared practice guidelines for diagnosis and treatment of ADHD in 2000 and 2001 and in 2011. I currently serve as the Stanford site PI and member of the Executive Committee of DBPNet, a research consortium of 16 DBP programs at academic medical centers across the US that conducts health services research.

I am an experienced mentor and teacher. I have served as PI on federal training grants, including a Leadership Education in Neurodevelopmental Disabilities grant to University of Pittsburgh (MCJ-429414/T73 MC 00036), General Pediatrics Training Grant to University of Pittsburgh (DO8 PE 50102), and fellowship training grants from Maternal and Child Health Bureau to Children's Hospital of Pittsburgh (T77 MC 00031) and to Stanford University (T77MC09796). I previously served as primary mentor for Irene M. Loe MD on a K-23 Mentored Career Development Award (K23HD071971) and Katherine E. Travis PhD, on a K-99 R00 Pathway to Independence Mentored Career Development Award (K99HD084749). I am currently primary mentor for Yair Bannett MD on a K-23 Mentored Career Development Award and a mentor for Fiona Baumer MD, Child Neurologist K-23 (K23NS116110) who is evaluating language in children with epilepsy.

Ongoing projects that I would like to highlight include:

Grant: 2R01 HD069150, Heidi M Feldman MD PhD, PI

Predicting language processing efficiency in preterm children: Social-environmental and neurobiological factors
Dates: 9/20/2020-5/31/2025

In this longitudinal study, we explore the unique and overlapping effects of social-environmental and neurobiological factors on the development of language processing efficiency at 18 months of age in English- and Spanish-speaking children born preterm.

A. Recent representative publications that highlight my experiences (*mentees or trainees):

1. Bruckert L*, Borchers LR*, Dodson CK*, Marchman VA Travis KE*, Ben-Shachar M, **Feldman HM**. White matter plasticity in reading-related pathways differs in children born preterm and at term: a longitudinal study. *Frontiers in Human Neuroscience*, 2019, May 8, 2019, 13:139. 10.3389/fnhum.2019.00139 PMID:31139064
2. Dubner SE*, Rose J, **Feldman HM**, Travis KE. Near-Term White Matter Tract Microstructure and Language Outcomes in 2-year-old Children Born Preterm. *Neuroimage-Clinical*, 2020 Sept 29;28:102446. PMID: 33035964 doi: 10.1016/j.nicl.2020.102446.
3. Brignoni-Perez E*, Dubner S*, Ben-Shachar M, Berman S, Mezer AA, **Feldman HM**, Travis KE. White matter properties underlying reading abilities differ in 8-year-old children born full term and preterm: A multi-modal approach, *Neuroimage*, 2022 Apr 28: 119240. doi: 10.1016/j.neuroimage.2022.119240 PMID: 35490913
4. Bannett Y*, Gardner RM; **Feldman HM**, Huffman LC, Sanders L. Continuity of Care by Primary Care Provider in Young Children with Chronic Conditions. *Academic Pediatrics*, 2022 Jul 17;S1876-2859(22)00357-6. doi: 10.1016/j.acap.2022.07.012 PMID: 35858663

B. Positions, Scientific Appointments, and Honors

Positions and Scientific Appointments

1984-1987	Director, Child Development Unit, Children's Hospital of Pittsburgh (CHP)
1984-2006	Assistant to Full Professor, Pediatrics, University of Pittsburgh, Pittsburgh, PA
1987-1993	Division Chief, Child Development Unit, Children's Hospital of Pittsburgh
1989-1991	Acting Director, Down Syndrome Center, Children's Hospital of Pittsburgh
1990-1993	Program Chair, Section of Developmental and Behavioral Pediatrics, AAP
1992-1997	Member, Human Development and Aging, III Study Section NIH
1993-2001	Division Chief, General Academic Pediatrics, Children's Hospital of Pittsburgh
1996-2001	Member, Comm on Quality Improv Subcom on Attention-Deficit/Hyperactivity Disorder, AAP
2000-2001	Vice Chair for Faculty and Program Development, Department of Pediatrics, University of Pittsburgh School of Medicine
2001-2006	Ronald L and Patricia M Violi Professor of Pediatrics and Child Development, CHP
2006-2010	Liaison from SDBP, Subcommittee on Attention-Deficit/Hyperactivity Disorder, Revision of ADHD Guidelines, American Academy of Pediatrics (AAP)
2006-	Professor, Pediatrics, Stanford University, Stanford, CA
2006-	Ballinger-Swindells Endowed Prof of Developmental-Behavioral Pediatrics, Stanford University
2007-2012	Member, Behavioral and Biobehavioral Science Subcommittee, Eunice Kennedy Shriver NICHD

Honors

1999	Chancellor's Distinguished Teaching Award, University of Pittsburgh
1999	Awardee, National Pediatric Faculty Development Scholars Program
2006	Ballinger-Swindells Distinguished Professorship of Developmental and Behavioral Pediatrics
2012	C Anderson Aldrich Award, American Academy of Pediatrics
2016	Stanford University Department of Pediatrics Clinical Research Award of Excellence
2020	Inaugural member, National Academy of Distinguished Educators in Pediatrics

C. Contributions to Science

1. **The development of a communication system by deaf children of hearing parents.** Children typically learn the language of their parents and community. What if no model is available? This

longitudinal observation study found that deaf children of hearing parents who are not exposed to sign language nonetheless create a manual-gestural system called “home sign”. It is a structured system that includes many features of spoken language. Susan Goldin-Meadow and I collaborated equally as PIs on the project and we used the data to fulfill requirements for our PhD dissertation. *This study contributed to theories of language development, demonstrating that communication can develop from general cognitive and social functions. It also had implications for intervention for children who are deaf; given that the children will sign, it is advisable to teach them a sign language that has all of the features of natural verbal languages. This research spawned many studies on the development of home sign in different countries and cultures.*

- a. Goldin-Meadow S & **Feldman HM**. The development of language-like communication without a language models. *Science*, 1977, 197(4301), 401-403. PMID: 877567
- b. **Feldman HM**, Goldin-Meadow S, & Gleitman L. Beyond Herodotus: The creation of language by linguistically deprived deaf children. In Lock A. (Ed.), *Action, Symbol, and Gesture: The Emergence of Language*. London: Academic Press, 1977.

2. **Resilience of language in children with focal left-hemisphere injury.** In adults the left hemisphere serves language function. An unanswered question was whether an intact left hemisphere would be necessary to learn language. I designed a longitudinal observational study to evaluate language development in children with prenatal or early injuries to the usual left hemisphere neural substrate for language. The study showed that children with injuries to either hemisphere showed mild-to-moderate initial delays and then near-normal rates of development. At older ages, they showed delays in the understanding of complex syntax and slow speed of processing, despite normal intelligence and language scores. Functional neuroimaging studies found activations during language processing either in right hemisphere homologous regions or left hemisphere peri-lesional regions. *These studies documented plasticity for language learning after left hemisphere brain injury. The resulting theory about language learning in the brain is that multiple areas of the brain beyond the left hemisphere are important for launching the learning process. Language learning itself contributes to sculpting the brain’s language networks. Though a predilection for organizing the left hemisphere for language is present, alternative neural organizations are possible when the left hemisphere injury precludes its participation in language learning.*

- a. **Feldman HM**, MacWhinney B, Sacco K. Sentence Processing in Children with Early Unilateral Brain Injury. *Brain and Language*, 2002, 83, 335-352. PMID:12387801
- b. Booth JR, MacWhinney B, Thulborn KR, Sacco K, Voyvodic J, **Feldman HM**. Developmental and lesion effects in brain activation during sentence comprehension and mental rotation. *Developmental Neuropsychology*, 2000, 18, 139-169. PMID: 11280962
- c. MacWhinney B, **Feldman HM**, Sacco K, Valdez-Perez R. Online measures of basic language skills in children with early focal brain lesions. *Brain & Language*, 2000, 71, 400-431. PMID:10716870
- d. **Feldman HM**, Holland AL, Kemp SS & Janosky JE. Language development after unilateral brain injury. *Brain and Language*, 1992, 42, 89-102. PMID:1547471

3. **Otitis media does not cause delays or disorders in development.** Prior to this research, the assumption that chronic otitis media with effusion compromised development of language and other domains was used to justify surgical intervention to relieve the effusion. This study addressed the question, “Do chronic ear infections cause delays or disorders in language, speech, cognition, academic skills, or behavioral characteristics?” The novel feature of the study was the use of a randomized controlled trial of early versus delayed/no tympanostomy tube placement for children with chronic otitis media in order to address the issue of causality. The study enrolled 6350 children who were less than 2 months of age and followed them monthly for the presence of otitis media until they turned 3 years of age. All of the children were evaluated with an age-appropriate comprehensive battery at 3, 4, 6, and 9-11 years of age. As the co-PI of the study, my role was to construct the outcomes measures protocol, contribute to analysis and interpretation of data, and participate in manuscript preparation. The results showed that early placement of tympanostomy tubes did not alter any of the outcomes at any of the ages. *Largely based on the results from this series of studies, a joint committee of the American Academy of Pediatrics, the American Academy of Family Physicians, and the American Academy of Otolaryngology, Head and Neck Surgery changed the practice guidelines for*

the management of chronic otitis media. The research contributed to understanding the resilience of language development in the face of mild and intermittent hearing loss from middle ear effusion.

- a. Paradise JL, **Feldman HM**, Campbell TF, Dollaghan CA, Rockette HE, Pitcairn DL, Smith CG, Colborn DK, Bernard BS, Kurs-Lasky M, Janosky JE, Sabo DL, O'Connor RE, and Pelham WE. Early or Delayed Insertion of Tympanostomy Tubes and Developmental Outcomes at Nine to Eleven Years of Age. *New England Journal of Medicine*, 2007, 356(3):248-61. PMID:17229952
- b. Paradise JL, Campbell TF, Dollaghan CA, **Feldman HM**, Bernard BS, Colborn DK, Rockette HE, Janosky JE, Pitcairn DL, Kurs-Lasky M, Sabo DL, Smith CG. Effect of early or delayed insertion of tympanostomy tubes for persistent otitis media on developmental outcomes at age 6 years. *New England Journal of Medicine*, 2005, 353, 576-586. PMID:16093466
- c. Paradise JL, **Feldman HM**, Campbell TF, Dollaghan CA, Colborn DK, Bernard BS, Rockette HE, Janosky JE, Pitcairn DL, Sabo DL, Kurs-Lasky M, Smith CG. Early versus delayed tympanostomy-tube placement for persistent otitis media: Developmental outcomes at age 3 years. *New England Journal of Medicine*, 2001, 344, 1179-1187. PMID:11309632
- d. **Feldman HM**, Dollaghan C, Campbell T, Kurs-Lasky M, Janosky JE, Paradise JL. Measurement properties of the MacArthur Communicative Development Inventory at ages 1 and 2 years. *Child Development*, March/April 2000, 71:2, 310-322. PMID:10834466

4. **Properties of the white matter in the brain are associated with language and reading outcomes in children born preterm.** Prematurity affects 10% of US children. Approximately 50% of children born very or extremely preterm are at risk for neurodevelopmental disorders, including disturbances of language, cognition and reading. Children born preterm are also at risk for injuries to the white matter of the brain. Diffusion MRI (dMRI) is well suited to characterizing the white matter. New methods, such as quantitative T1 relaxometry can complement dMRI by estimating myelin content in white matter pathways. In a series of studies using behavioral and neuroimaging assessments, we have described adverse outcomes of prematurity in the development of language and reading and found associations of these skills and properties of white matter pathways in the brain. *The results of this study documented that children born preterm have particular difficulties in linguistic processing efficiency, including speed of processing that predict later skills. Group differences in white matter microstructure between children born preterm and full term are stable over childhood. We have also demonstrated that language and reading outcomes of prematurity are associated with white matter properties. We found that the underlying neurobiology of good and poor reading in children born preterm may be different from the neurobiology of reading in full term children. A spin-off of the main study was the development of an automated method of white matter analysis, called Automated Fiber Quantification or AFQ. This method reduces the time and labor required for the evaluation of white matter properties and makes it more feasible to use diffusion as a clinical tool. The analytic programs have been made publicly available to encourage their use at different centers.*

- a. Travis KE*, Castro MRH* Berman, S, Dodson CK*, Mezer AA, Ben-Shachar M, **Feldman HM**. More than Myelin: Probing white matter differences in prematurity with quantitative T1 and diffusion MRI. *Neuroimage – Clinical*, 2019, Mar 12;22:101756 PMID:30901711
- b. Borchers LR*, Bruckert L*, Travis KE, Dodson CK*, Loe IM, Marchman VA, **Feldman HM**. Predicting text reading skills at age 8 years in children born preterm and at term. *Early Human Development*, 2019, 130: 80–86. PMID:30708270
- c. Marchman VA, Ashland MD, Loi EC*, Adams KA*, Fernald A, **Feldman HM**. Predictors of early vocabulary growth in children born preterm and full term. *Child Neuropsychology: a journal on normal and abnormal development in childhood and adolescence*, 2019, *Child Neuropsychology*, 2019 Feb 4:1-21 PMID: 30714476
- d. Dodson CK*, Travis KE, Borchers LR*, Marchman V, Ben-Shachar M, **Feldman HM**. White matter properties associated with pre-reading skills in 6-year-old children born preterm and full-term. *Developmental Medicine and Child Neurology*, 2018, 60(7): 695-702. doi: 10.1111/dmcn.13783. PMID: 29722009

5. **Developmental-behavioral pediatrics emphasizes family-centered individualized care to children with a wide range of high prevalence and high-severity disorders.** Developmental-behavioral pediatrics is a relatively new subspecialty in pediatrics; it provides direct care for children with disabilities and leadership within pediatrics to improve treatment and support for children with delays and disorders and their families. *I served as an Editor to the premier textbook in the field and have*

participated in the development and dissemination of practice guidelines for Attention-Deficit Hyperactivity Disorder. I also authored a recent book outlining an approach to health care for children with disabilities that recommends that we conceptualize health care for these children as a means to allowing them to be included and make contributions to their families, schools, neighborhoods, and communities. I am a member of the Executive Committee of DBPNet, a research network in my field.

- a. Carey WB, Coleman W, Crocker AC, Elias E, and **Feldman HM** (Eds) *Developmental-Behavioral Pediatrics, Fourth Edition*. Philadelphia, PA: Elsevier, 2009, 1060 pages, ISBN 978-4160-3370-7.
- b. **Feldman HM**. *Redesigning Health Care for Children with Disabilities: Strengthening inclusion, contribution, and health*. Baltimore MD: Brookes Publishing, 2013, 280 pages.
- c. **Feldman HM** and Reiss MI. Clinical Practice. Attention-Deficit/Hyperactivity Disorder in Children and Adolescents. *New England Journal of Medicine*, 2014, 370(9): 838-46.. PMID:24571756
- d. **Feldman HM**, Blum NJ, Gahman A, Shults J. Diagnosis of Attention-Deficit/Hyperactivity Disorder by Developmental Pediatricians in Academic Centers: A DBPNet Study. *Academic Pediatrics*, 2015 May-Jun;15(3):282-8. DOI: <http://dx.doi.org/10.1016/j.acap.2014.09.004> PMID: 25441653

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