

## BIOGRAPHICAL SKETCH

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NAME <b>Cutting, Laurie E.</b>	POSITION TITLE <b>Professor of Education and Human Development, Radiology and Radiological Sciences, and Pediatrics</b>		
eRA COMMONS USER NAME (credential, e.g., agency login) <b>CUTTING</b>			
EDUCATION/TRAINING (Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable.)			
INSTITUTION AND LOCATION	DEGREE <i>(if applicable)</i>	MM/YY	FIELD OF STUDY
American University, Washington, DC	BA	05/93	Literature
Northwestern University, Evanston, IL	MA	06/95	Comm Sci & Dis
Northwestern University, Evanston, IL	PhD	07/97	Comm Sci & Dis
Johns Hopkins University, School of Medicine	Post-Doc	1999	Neurology/Cognitive Neuroscience
AAAS/SRCD Executive Branch Fellowship, NICHD	Post-Doc	2002-2003	Science Policy

### A. Personal Statement

Currently, I am the Patricia and Rodes Hart Professor of Education and Human Development, Radiology, and Pediatrics at Vanderbilt University. My research program at Vanderbilt focuses on understanding both the neurobiological and behavioral aspects of developmental and genetic disorders related to reading, language, and executive functions, with the goal of better understanding their etiology. To accomplish this, we use various neuroimaging modalities (DTI, fMRI, and volumetric MRI) in combination with traditional behavioral and experimental methods. Ultimately, the goal of this research is to lead to the design of the most optimal interventions for children, including children with IDD who struggle in these various areas of cognition. Prior to joining the faculty at Vanderbilt University, I was an Associate Professor of Neurology at Johns Hopkins University/Kennedy Krieger Institute, where I directed a similar program of research. My background in this field is unique: I completed a doctorate in Communication Sciences and Disorders, followed by a post-doctoral fellowship in Developmental Cognitive Neurology/Neuroscience at Johns Hopkins School of Medicine, in which I pursued studies on neurobiological foundations of learning and related disorders, and acquired the skills necessary to use neuroimaging methodologies to study the neural substrates of cognition. I then joined the faculty in the Department of Neurology at Johns Hopkins School of Medicine where I developed and directed my research program, serving as Principal Investigator and Co-Investigator on a multiple NIH, Department of Defense, and Institute for Education Sciences grants. I also served as the Associate Director of the Kennedy Krieger/Johns Hopkins School of Medicine *Learning Disabilities Research Center*. All but one of these grants included large scale neuroimaging components (DTI; fMRI; aMRI), with the *Learning Disabilities Research Center* grant in particular including multiple intertwining imaging modalities and projects. During the 10 years on faculty at Johns Hopkins, I contributed in various ways to better understanding the neurobiological correlates of IDDs, including uncovering novel discoveries about relationship between brain volume to cognition in various IDDs, implementing DTI before it was a commonly used in IDDs, and developing novel treatment (intervention) protocols for the academic difficulties associated with genetic disorders. Currently, I am a Principle Investigator as well as a Co-Investigator on several NICHD-funded research projects focusing on neurobiological, behavioral, and genetic aspects of developmental disorders. My interdisciplinary approach to managing and facilitating translational research in the field of developmental disabilities is a key aspect of my expertise. In my capacity as Director of the Translational Neuroimaging Core, a primary goal will be to facilitate and promote linkages between neuroimaging methodologies (MR and EEG) and other scientific methods used in developmental disabilities (behavioral, genetic). Therefore, Core C will serve as a bridge between available methodological expertise at the Vanderbilt University Institute for Imaging Sciences (VUIIS) and scientific questions specifically applicable to developmental disabilities. As Director of the Core, I and my co-investigators/staff will directly provide expertise in applying various modalities of imaging (e.g., EEG/ERP, fMRI, DTI, volumetric MR), as well as provide services that include innovative automated and integrated data analyses approaches.

## B. Positions and Honors

### Positions and Employment

1997-1999	Postdoctoral Fellow, Kennedy Krieger Inst, Developmental Cognitive Neurology/Neuroscience
1999-2009	Research Psychologist, Kennedy Krieger Institute
1999-2000	Instructor, Johns Hopkins University School of Medicine, Baltimore, MD
2000-2006	Assistant Professor of Neurology, Johns Hopkins University School of Medicine
2001-2006	Assistant Professor of Education, Johns Hopkins University (secondary appointment)
2004-present	Research Affiliate, Haskins Laboratories
2006-present	Associate Professor of Neurology, Johns Hopkins University School of Medicine (Adjunct 9/1/09-present)
2006-2009	Associate Professor of Education, Johns Hopkins University (secondary appointment)
2008-2009	Director, The Education and Brain Research Program, Kennedy Krieger Institute
2009-present	Patricia and Rodes Hart Associate Professor of Education and Human Development, Radiology, and Pediatrics; Director, The Education and Brain Sciences Research Laboratory
2014-present	Patricia and Rodes Hart Professor of Education and Human Development, Radiology, and Pediatrics; Director, The Education and Brain Sciences Research Laboratory

### Other Experience and Professional Memberships

1995	Pre-doctoral Intern, Yale University School of Medicine, Center for Learning and Attention,
2000-2009	Advisory Committee, General Clinical Research Centers, Johns Hopkins School of Medicine
2000-2009	Member, General Clinical Research Center Protocol Review Subcommittee for the Neurobehavioral Research Unit
2002-2003	Fellow, American Association for the Advancement of Science/Society for Research in Child Development Executive Branch Policy Fellowship Program, NIH/NICHHD
2005	White House Fellow, Regional Finalist
2007-2009	Member, Federal Reading First Advisory Panel
2009-present	Training Faculty, Vanderbilt Brain Institute
2009-present	Vanderbilt University Kennedy Center Investigator and Director of the Reading Clinic
2009-present	Center for Integrative and Cognitive Neuroscience
2011-2012	Vanderbilt Brain Institute Interim Steering Committee
2004-present	Ad hoc reviewer, NIH, NSF, Children's Tumor Foundation, Australian Science Fund, others
Oct 2012	Standing Study Section member, LCOM/NIH
Jan 2015	White House Office of Science and Technology Workshop on Neuroscience and Learning

## C. Contribution to Science

### 1. Application of Structural and Functional Imaging Techniques in IDD's

Dr. Cutting has applied neuroimaging techniques to various developmental disorders in an effort to better understand the neurobiological basis of them. In this capacity, she has contributed novel insights into IDD's. For example, her work helped identify the neurobiological impact of Attention Deficit Hyperactivity Disorder on brain volume in those with Neurofibromatosis Type 1 (**NF1**); she was the first to characterize neurobiological correlates of a prevalent type of reading disability; and, she has been a pioneer in studying the neurocognitive basis of higher-level written language (reading comprehension) difficulty. She also was among the first to apply diffusion tensor imaging methods to characterize those with dyslexia, including most recently mapping subcortical-cortical connectivity patterns from the thalamus and visual word form area in those with dyslexia. Such findings have revealed the importance of white matter microstructure and novel insights into neurobiological anomalies associated with IDD's.

- Cutting, L.E.**, Cooper, K.L., Koth, C.W., Mostofsky, S.H., Kates, W.R., Denckla M.B., & Kaufmann, W.E. (2002). Megalencephaly in NF1: Predominantly white matter contribution and mitigation by ADHD. *Neurology*, 59, 1388-94. PMID: In progress
- Rimrodt, S. L., Clements-Stephens, A. M., Pugh, K. R., Courtney, S., Gaur, P., Pekar, J. J., & **Cutting, L. E.** (2009). Functional MRI of sentence comprehension in adolescents with dyslexia: Neurobiology beyond the single word. *Cerebral Cortex*, 19, 402-13. PMID: PMC2638788
- Lauzon, C.B., Asman, A.J., Esparza, M.L., Burns, S.S., Fan, Q., Gao, Y., Anderson, A.W., Davis, N., **Cutting, L.E.**, & Landman, B.A. (2013). Simultaneous Analysis and Quality Assurance for Diffusion Tensor

Imaging, PloS one 8 (4), e61737. PMID: PMC3640065

- d) Fan, Q., Anderson, A., Davis, N., & **Cutting, L.E.** (2014). Structural connectivity patterns associated with the putative visual word form area and children's reading ability. *Brain Research*, 1586,118-29. PMID: In progress.

## 2. Use of Neurobiological Indices to Predict Learning in IDD

Dr. Cutting has been one of a handful of investigators that have been focusing on examining using neural indices to predict learning and outcomes in those with learning (reading) disabilities. For example, in the first quantitative meta-analysis of reading intervention, she showed that several regions were specifically related to response to intervention; findings revealed that change in functional activation following reading intervention was present in areas not always noted within various small scale studies, including left thalamus, right insula, and right posterior cingulate. These findings suggest more specificity in terms of particular regions (and corresponding cognitive functions) that may be more amenable to change. Current work in the lab is examining, for the first time, the use of baseline fMRI indices to predict intervention response after a controlled, short-term reading intervention is implemented in those with dyslexia and NF1. We are also examining resting state fMRI and DTI indices as predictors of growth over time. Such approaches could ultimately help with ways to determine more effective treatment approach selection for those with IDD.

- a) Davis, N., Fan, Q., Compton, D. L., Fuchs, D., Fuchs, L. S., **Cutting, L. E.**, Gore, J. C., & Anderson, A. W. (2010). Influences of neural pathway integrity on children's response to reading instruction. *Frontiers in Systems Neuroscience*, 4, 1-11. PMID: PMC2982724
- b) Clements-Stephens, A. M., Materek, A. D., Eason, S. H., Scarborough, H. S., Pugh, K. R., Rimrodt, S., Pekar, J. J., & **Cutting, L. E.** (2012). Neural circuitry associated with two different approaches to novel word learning. *Developmental Cognitive Neuroscience*, 2, 99-113. PMID: PMC3295245
- c) Barquero, L.A., Davis, N., & **Cutting, L.E.** (2014). Neuroimaging of Reading Intervention: A Systematic Review and Activation Likelihood Estimate Meta-Analysis. *PLOS ONE*, 9, 1-16. PMID: PMC3888398.
- d) Rimrodt, S. R., Peterson, D. J., Kaufmann, W. E., Denckla, M. B., & **Cutting, L. E.** (2010). White matter microstructural differences linked to left superior longitudinal fasciculus in children with dyslexia. *Cortex*, 46, 739-49.

## 3. Role of Genetics in IDD: Neurocognitive profile of Neurofibromatosis Type 1 (NF1)

Dr. Cutting has played a leading role in the field in characterizing cognitive and neurobiological profile of children with NF1, including conducting the first reading intervention study of NF1. This study also included indices of biological change, and thus is the only clinical trial that involves usage of neurobiological indices as related to outcome of academic training in NF1.

- a) Clements-Stephens, A., Rimrodt, S. L., Gaur, P., & **Cutting, L. E.** (2008). Visuospatial processing in children with Neurofibromatosis Type 1. *Neuropsychologia*, 46, 690-7. PMID: PMC2275808
- b) **Cutting, L. E.** & Levine, T. M. (2010). Cognitive profile of children with Neurofibromatosis and reading disabilities. *Child Neuropsychology*, 417-32. PMID: PMC2929318
- c) Acosta, M. T., Bearden, C. E., Castellanos, X. F., **Cutting, L.**, Elgersma, Y., Gioia, G., Gutmann, D. H., Lee, Y. S., Legius, E., Muenke, M., North, K., Parada, L. F., Ratner, N., Hunter-Schaedle, K., Silva, A.J. (2012). The Learning Disabilities Network (LeadNet): Using neurofibromatosis type 1 (NF1) as a paradigm for translational research. *American Journal of Medical Genetics*, 158A, 9, 2225–2232. PMID: PMC4074877
- d) Barquero, L., Sefcik, A., **Cutting, L.E.**, & Rimrodt, S. (in press). Teaching Reading to Children with Neurofibromatosis Type 1: A Clinical Trial with Random Assignment to Different Approaches. *Developmental Medicine & Child Neurology*. PMID in progress.

## 4. Behavioral Genetics: Contributions to IDD

Dr. Cutting has contributed to the literature that has examined genetic versus environmental influences on reading and math development. She currently is conducting a study with collaborators at Ohio State examining within a genetically sensitive design the heritability of various cognitive functions by using various neuroimaging techniques in large longitudinal cohorts of twins selected for reading difficulties (N=~800). Such investigation is novel and important, and will help elucidate in pediatric populations the influence of genetic versus environmental effects on brain structure and functioning, particularly with regard to IDD (learning disabilities). Usage of multi-modal neuroimaging datasets in combination with longitudinal behavioral genetics

data that captures specific aspects of cognitive, academic, emotional, and environmental influences has the potential to contribute substantially to our knowledge of the biological underpinnings of IDD.

- a) Hart, S. A., Petrill, S. A., Willcutt, E., Thompson, L., Schatschneider, C., Deater-Deckard, K., & **Cutting, L. E.** (2010). Exploring how ADHD symptoms are related to reading and mathematics performance: General genes, general environments. *Psychological Science* 21, 1708-1715. PMID: PMC3708699
- b) Petrill, S. A., Hart, S. A., Harlaar, N., Logan, J., Justice, L. M., Schatschneider, C., Thompson, L., DeThorne, L. S., Deater-Deckard, K., & **Cutting, L. E.** (2010). Genetic and environmental influences on the growth of early reading skills. *Journal of Child Psychology and Psychiatry*, 51, 660-7. PMID: PMC2891369
- c) Wang, Z., Deater-Deckard, K., **Cutting, L. E.**, Thompson, L., Petrill, S. A. (2012). Working memory and parent-rated components of attention in middle childhood: A behavioral genetic study. *Behavioral Genetics*, 42, 199-208. PMID: PMC3413272
- d) Logan, J. A. R., Hart, S. A., **Cutting, L.**, Deater-Deckard, K., Schatschneider, C., Thompson, L. A., & Petrill, S. A. (2013). Genetic and Environmental Etiology of Latent Quadratic Growth in Reading Skills. *Child Development*, 84(6), 2131-2144. PMID: PMC3773299

## 5. Organizing Activities

Dr. Cutting has played a key role in developing the Educational Neuroscience Ph.D. program at Vanderbilt University, building bridges across the medical center, neuroscience graduate program, and school of education. This highly competitive Ph.D. program is now successfully recruiting its third cohort. Dr. Cutting is also the head of the scientific advisory Board of *The Dyslexia Foundation* and is on the Vanderbilt Brain Institute's Steering Committee; she likewise serves on various editorial boards, along with being a member of a standing NIH study section, and is routinely an invited speaker at various conferences, including the *Norman Geshwind Lecture* at the International Dyslexia Association and White House OSTP Workshop on Neuroscience and Learning.

### Scientific Metrics (on July 15, 2015)

- 62 peer-reviewed journal articles
- Google Scholar Profile: <https://scholar.google.com/citations?user=B7RMujIAAAAJ&hl=en>
- H-index: 31; I-10 index: 49; Total citations: 3407
- Research Gate profile: [http://www.researchgate.net/profile/Laurie\\_Cutting](http://www.researchgate.net/profile/Laurie_Cutting)
- Cumulative impact factor: 221.80; RG score: 34.04 (>92.5% percentile)

**Laboratory Web site:** <http://kc.vanderbilt.edu/educationandbrainlab/index.html>

## D. Research Support

### Ongoing Research Support

5R01 HD067254 (PI: Cutting) 09/28/10 – 07/31/15  
NIH / NICHD

*Predicting Late-Emerging RD: Neurobiological and Cognitive Factors*

The purpose of this research grant is to gain a deeper understanding of the cognitive and neurobiological characteristics as well as prediction of late emerging reading disabilities.

5R01 HD044073 (PI: Cutting) 08/01/10 – 07/31/15 N.C.E. \*\*  
NIH / NICHD

*Cognitive and Neural Processes in Reading Comprehension*

The purpose of this grant is to determine the cognitive and neural correlates of children who have specific deficits in reading comprehension. \*\*Note: Competitive renewal just reviewed and received an 8<sup>th</sup> percentile; funding level for NICHD is 9<sup>th</sup> percentile so it is anticipated that this grant will be renewed.

Learning Disabilities Research Hub (PI: Petrill) 10/1/12 – 9/30/16  
NIH / NICHD - R24HD075460

*Neurobiological Underpinnings of Math and Reading Comorbidity: A Twin Study*

The goal of this project is to conduct a systematic examination of the gene-brain-behavior relationships, using neuroimaging and genetic analyses, in representative samples of same-sex twin pairs.

Role: Co-Investigator

5P30HD015052 (PI: Dykens)

05/1/13 – 6/30/15 N.C.E.

NIH/NICHD

*Eunice Kennedy Shriver Intellectual and Developmental Disability Research Center*

This Center provides cutting-edge research services to Vanderbilt Kennedy Center investigators that allows them to make new discoveries about the causes of developmental disabilities, and how to best intervene to foster successful outcomes in children and adults.

Role: Co-Investigator/Neuroimaging Core Director

P01 HD 01994 Rueckl/Pugh (PI)

05/01/2012 - 04/30/2017

NIH / NICHD

The Nature and Acquisition of the Speech Code and Reading

The goal of this project is to better understand the reading process by 1) examining the relation of reading to spoken language and 2) examining the relation between cognitive performance and brain organization.

Role: Consultant

U.S. Department of Education (PIs: Hasselbring & Rose) 1/1/12-12/31/16

Office of Special Education and Rehabilitation.

*Center on the Use of Emerging Technologies to Improve Literacy Achievement for Students with Disabilities in Middle School.*

The purpose of this project is to use technology to improve the literacy skills of middle school students.

Role: Co-Investigator

Hobbs Discovery Grant (PI: Cutting)

1/1/14-12/31/15

*Using Novel MR Techniques to Provide Further Biological Specificity of RD*

The purpose of this project is to use novel multimodal neuroimaging methods to examine the biological specificity of reading disabilities in adults.

### **Completed Research Support**

5 R01 HD38075-04 (PI: Petrill)

11/01/06 – 03/31/14

NIH / NICHD

*Environmental Influences on Early Reading: A Twin Study*

The goal of this project is to conduct a systematic developmental genetic examination of reading comprehension using a representative sample of 350 same-sex twin pairs.

Role: Co-Investigator (PI of subcontract)

5R01 NS049096-05 Cutting (PI)

04/01/06 – 10/31/12

NIH / NINDS

*Neurobiology and Treatment of Reading Disability in NF-1*

The purpose of this research grant is to gain a deeper understanding of the characteristics and treatment of reading disabilities in children with NF1.

5P50 HD052121-03 Denckla (PI)

09/29/06 – 07/31/12

NIH / NICHD

Reading Disability in Grades 3-8: Neurocognitive Factors

RFA: RFA-HD-04-027 LDRC: Multidisciplinary Research Centers

The purpose of this program project focuses on trying to understand the behavioral and neurobiological correlates, as well as the prevalence of different types of reading disabilities in older children.

Role: Co-Investigator (PI of Project I and Associate Director of LDRC)

