
BIOGRAPHICAL SKETCH

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NAME: DeLuca, Stephanie

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

POSITION TITLE: Director, VTCFBRI Neuromotor Clinic; Associate Professor School of Neuroscience and Pediatrics

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 (if applicable)	MM/YY	FIELD OF STUDY
University of Alabama at Birmingham	B.A.	1991	Psychology
University of Alabama at Birmingham	M.S.	2001	Developmental Psychology
University of Alabama at Birmingham	Ph.D.	2002	Developmental Psychology

A. Personal Statement

I am very enthusiastic about this application to create a new research infrastructure center. I will participate in all components of the proposed National Pediatric Rehabilitation Resource Center and serve as the Core Head for Didactic Interactions and the Co-head (with Jill Heathcock) for Techniques Development.

I currently serve as a Multiple PI on two NIH Phase II randomized controlled trials (RCT's) and Co-I for a NIH Phase III 12-site RCT known as I-ACQUIRE for infants with Perinatal Arterial Ischemic Stroke. I have participated in numerous clinical trials involving both adults and children. These experiences have produced transformative findings based on well-designed, well-conducted studies. With that said, there is a paucity of information available to professionals and families within the entire pediatric rehabilitation community and there is a need to conduct exemplary research to guide the field in identifying, choosing, testing, and implementing other efficacious and effective treatments. To do this, clinical trials are crucial and need to be of the highest quality, which is why I am supportive of the current proposal.

I will participate in multiple levels of this proposal and have a wonderful working relationship with all named investigators. I bring expertise in developing new outcome measures through my previous clinical trials experiences and also through my efforts with the American Academy for Cerebral Palsy and Developmental Medicine (I serve on the Board of Directors) and with the American Congress of Rehabilitation Medicine. Many of the neurobehavioral techniques that could be supported as pilot projects through this proposal are likely to build on computer, information, and imaging technology that all children can benefit from. Lastly, I have worked closely with Sharon Ramey who serves as the PI for this proposal for many years.

1. DeLuca, S. C., Echols, K., Ramey, S.L. (2007). *ACQUIREc Therapy: A Training Manual for Effective Application of Pediatric Constraint-Induced Movement Therapy*, MindNurture, Hillsborough, NC.
2. DeLuca, S.C., Case-Smith, J., Stevenson, R., & Ramey, S.L. (2012). Constraint-Induced Movement Therapy (CIMT) for young children with cerebral palsy: Effects of therapeutic dosage. *Journal of Pediatric Rehabilitation Medicine*, 5, 133-142. doi:10.3233/PRM-2012-0206
3. DeLuca, S.C., Ramey, S.L., Trucks, M.R., Wallace, D.A. (2015). Multiple epochs of Constraint-Induced Movement Therapy (CIMT) for children with cerebral palsy. *AJOT*. 69, 6.
4. Bamman M., Cutter, G.R., Brienza, D.M., Chae, J., Corcos, D.M., DeLuca, S.D., Field-Fote, E., Fouad, M.N., Lang, C., Lindblad, A., Motl, R.W., Perna, C.G., Reisman, D., Saag, K.M., Savitz, S.I., Schmitz, K.Z., Stevenms-Lapsley, J.S., Whyte, J., Winstein, C.J., Michel, M.E. (2018). Medical rehabilitation: guidelines to advance the field with high-impact clinical trials. *Arch of Phy Med and Rehab*. DOI: [10.1016/j.apmr.2018.08.173](https://doi.org/10.1016/j.apmr.2018.08.173)

B. Positions and Honors

Positions and Employment

1993-2000 Research Assistant and Project Coordinator, Department of Psychology, University of Alabama at Birmingham (UAB)

- 2000-2013 Director of the Pediatric Neuromotor Research Clinic, Civitan International Research Center/Sparks Clinics, UAB
- 2007-2013 Assistant Professor, Department of Occupational Therapy, School of Health Related Professions, (UAB)
- 2013 - 2019 Assistant Research Professor, Fralin Biomedical Research Institute (FBRI) and Department of Psychology, Virginia Tech (VT); Assistant Professor of Pediatrics, Virginia Tech Carilion School of Medicine; and Assistant Professor of Rehabilitation and Wellness Jefferson College of Health Professions,
- 2019 – Associate Professor, Fralin Biomedical Research Institute (FBRI) and School of Neuroscience, Virginia Tech, Pediatrics, Virginia Tech Carilion School of Medicine.
Director of the Treatment Implementation Center for I-ACQUIRE
- 2013 -- Director, FBRI Neuromotor Research Clinic, Virginia Tech

Other Experiences and Professional Membership

- 2003- American Academy for Cerebral Palsy and Developmental Medicine (AACPDMD)
 - a. 2012 – 2014 Treatment Outcomes Committee
 - b. 2012 – 2013 Scientific Program Committee
 - c. 2014 - 2015 Advocacy Committee (Chair)
 - d. 2015 – Present Elected Director to Board of Directors
- 2012 American Occupational Therapy Association
- Nov. 2014 NINDS Clinical Trials Special Emphasis Panel (ad hoc)
- 2013 NIH Motor, Function, Speech, and Rehabilitation (ad hoc)

Honors

- 2001-2002 Outstanding Graduate Student, Developmental Psychology Doctoral Program, The University of Alabama at Birmingham, Birmingham, AL
- 2019 VTC School of Medicine, Outstanding Research Mentor Award

C. Contributions to Science

1. Development of Constraint-Induced Movement Therapy

From 1989 until 1999, I worked collaboratively in the research and clinical laboratory of Dr. Edward Taub, a primary scientist who developed the early theories regarding how ‘learned nonuse’ affected the presentation of behavioral signs after the onset of a neurological injury. Learned nonuse is based on bench science completed with primates and is considered to be responsible for causing excessive dysfunction (disability) in individuals with central nervous system (CNS) damage. The basic interpretation of learned nonuse states that a certain level of function is temporarily concealed after the immediate onset of a CNS lesion due to neuro-protective reactions (e.g., production of neuro-toxins causing functional neurons to break synaptic junctions with damaged neurons) during this acute phase of an injury. There are limited to no sensory receptors within the CNS to indicate when this function is reactivated through the recombination of synaptic connections (during chronic stages of an injury), and resultantly, many individuals never regain the previously masked functional abilities. Animal models and subsequent findings in adult research suggest that two rehabilitation treatment techniques are beneficial in helping individuals with unilateral CNS injury (impairments in the upper extremity) access this unused functional ability: 1) Restraint of an animal’s of human’s stronger upper extremity and 2) intensive practice utilizing the principles of operant conditioning with the weaker or disabled upper extremity. We combined these techniques into one intensive rehabilitation treatment protocol for individuals after stroke, which we termed Constraint-Induced Movement Therapy (CIMT).

- a. Taub, E., Crago, J. E., Burgio, L.D., Groomes, T.E., Cook, E.W., DeLuca, S.C., & Miller, N.E. (1994). An operant approach to rehabilitation medicine: Overcoming learned nonuse by shaping. *Journal of Experimental Analysis of Behavior*, 61, 281-293. PMID: 8169577.
- b. Taub, E., Pidikiti, R.D., DeLuca, S.C., & Crago, J.E. (1996). Effects of motor restriction of an unimpaired upper extremity and training on improving functional tasks and altering brain/behaviors. *Imaging and Neurologic Rehabilitation*, 133-154.

- c. Morris, D., Crago, J.E., DeLuca, S.C., Pidikiti, R.D., & Taub, E. (1997). Constraint-Induced Movement Therapy for motor recovery after stroke. *NeuroRehabilitation*, 9, 29-43.
- d. DeLuca, S.C., Trucks, M.R., Ainsworth, D., Ramey, S.L. (2017). Practice-based evidence from a clinical cohort who received pediatric constraint-induced movement therapy. *J of Ped Reh Med*.

2. Application of adult CIMT to pediatric populations and the first RCT on CIMT showing large and lasting changes in upper extremity (UE) quality and frequency of use, as well as specific UE skills.

CIMT for adults with chronic stroke served as a major advance in understanding the potential plasticity of recovery after CNS damage. I then took the lead role in the adaptation, operationalization, and formal testing via an RCT of a CIMT for young children (P-CIMT). The RCT with young children showed moderate to large effect size changes for all 9 of the treated children. We then completed a crossover with the original 9 controls, replicating the same findings. At 6 mos, the benefits were maintained. Our innovations for P-CIMT included use of a full-time cast to reduce developmental disregard or overcome learned non-use; 21 days of 6 hrs of therapy per day – a very high intensity protocol that all children tolerated well. During this trial, we also developed new treatment assessment tools to help us better understand treatment efficacy – the Pediatric Motor Activity Log, the Toddler Arm-Hand Use Test, and the Emerging Behaviors Scale. Since then, we wrote the first manualized administration guide that fully specified our P-CIMT protocol, so other researchers and clinicians could replicate the treatment and document its delivery in a systematic form. (We are now updating the manual with addition of more rigorous fidelity of implementation methods.) This manual serves as the guiding basis for P-CIMT protocols for funded Multisite RCT, with many additional specifications.

- a. Taub, E., Ramey, S.L., DeLuca, S.C., & Echols, K. (2004). Efficacy of Constraint-Induced (CI) Movement Therapy for children with cerebral palsy with asymmetric motor impairment. *Pediatrics*, 113(2), 305-12. PMID: 14754942.
- b. DeLuca, S.C., Echols, K., Law, C., & Ramey, S. (2006). Intensive pediatric Constraint-Induced therapy for children with cerebral palsy: A randomized controlled crossover trial. *Journal of Child Neurology*, 11, 931–38. PMID: 17092457.
- c. DeLuca, S. C., Echols, K., & Ramey, S.L. (2007) *ACQUIREc Therapy: A Training Manual for Effective Application of Pediatric Constraint-Induced Movement Therapy*. MindNurture, Chapel Hill.
- d. Ramey, S.L, DeLuca, S., Stevenson, R., Case-Smith, J., Darragh, A. & Conaway, M. (2019). Children with Hemiparesis Arm and Movement Project (CHAMP): A multi-site comparative efficacy trial of pediatric Constraint-Induced Movement Therapy (CIMT) testing effects of dosage and type of constraint for 2 to 8 year olds with hemiparetic cerebral palsy. *BMJ Open*.

3. The dissemination of efficacious P-CIMT protocols via training of therapists and in novel situations.

There is abundant literature surrounding both the adult and pediatric forms of CIMT. However, CIMT is still not routinely provided to many adults and children around the globe for multiple reasons. One of the most urgent is that therapists are not adequately trained in many areas of the world to sufficiently implement evidence-based protocols, nor have therapeutic protocols been routinely published with well-developed guidelines. Accordingly, with colleagues I have worked to identify the core components that distinguish CIMT and have conducted many workshops and week-long training sessions grounded in the scientific evidence to clearly identify the limits in our knowledge, while simultaneously informing and training individuals about the protocols that have documented efficacy. Myself and colleagues have published protocols both in scientific journals and also with support from major professional organizations, such as the American Occupational Therapy Association. These workshops and publications have informed therapists world-wide.

- a. Ramey, S.L., DeLuca, S.C. (Eds.) (2013). Pediatric Constraint-Induced Movement Therapy: History and Definition. *In Handbook of Pediatric Constraint-Induced Movement Therapy (CIMT): A Guide for Occupational Therapy and Health Care Clinicians, Researchers, and Educators*. The American Occupational Therapy Association. Bethesda, MD.
- b. Ramey, S.L, Coker-Bolt, P., DeLuca, S.C. (2013). Operationalizing pediatric constraint-induced movement therapy (P-CIMT): The core principles to inform training P-CIMT therapists,

measuring fidelity of implementation, and developing post-treatment plans. In *Handbook of Pediatric Constraint-Induced Movement Therapy (CIMT): A Guide for Occupational Therapy and Health Care Clinicians, Researchers, and Educators*. The American Occupational Therapy Association. Bethesda, MD.

- c. Coker-Bolt, P. DeLuca, S.C., Ramey, S.L. (2015) Training pediatric therapists to delivery Constraint-Induced Movement Therapy (CIMT) in Sub-Saharan Africa. *Occup Ther International*. Published Online May.

For More Information Regarding My Complete List of Published Work Please visit MyBibliography:
<http://www.ncbi.nlm.nih.gov/sites/myncbi/stephanie.deluca.1/bibliography/47466785/public/?sort=date&direction=ascending>

D. Research Support

Ongoing Research Support

1U01NS106655-01A1, S.L. Ramey (Lead PI) & Warren Lo (Multiple PI), 02/01/2019 – 01/31/2024, NINDS/NIH
Perinatal Arterial Stroke: A Multi-site RCT of Infant Rehabilitation (I-ACQUIRE)

Perinatal arterial ischemic stroke (PAS) occurs in an estimated 1 in 1150 livebirths and often leads to serious lifelong neuromotor impairment. This StrokeNet Phase III trial will provide definitive efficacy data from 12 sites (N=240) about an intensive form of infant rehabilitation (Infant ACQUIRE) to transform rehabilitation and improve clinical outcomes.

Role: Co-Investigator and Director of the Treatment Implementation Core

1R01HD074574-01A1, S. L. Ramey (Lead PI) & S. DeLuca (Multiple PI), 03/01/2014 - 02/28/2018, NICHD/NIH
(Projected No Cost Extension through 02/28/2020)

Multisite RCT of 3 Neurorehabilitation Therapies for Infants with Asymmetrical CP

This multisite randomized controlled trial tests 3 highly-promising new therapies for infants with asymmetrical CP (N=72) and will yield much needed data about the differential impact of these therapies on neuromotor outcomes and brain development up to 12 months post-treatment.

Role: MPI (Multiple Leadership Plan)

1R01HD068345-01A1, S. Ramey (Lead PI), S. DeLuca, R. Stevenson, 09/27/2012 – 07/30/2017, NICHD/NIH
(Projected No Cost Extension through 07/30/2019)

Multi-site RCT of Pediatric Constraint-Induced Movement Therapy (CIMT)

This is the first multi-site, randomized controlled trial (RCT) that comprises a comparative efficacy trial of ACQUIREc, a manualized form of pediatric constraint-induced movement therapy (CIMT), for 3 – 6 yr old children with unilateral cerebral palsy. The RCT (N=144) tests the efficacy of 2 different dosage levels and 2 types of constraint compared to a control condition (usual treatment). The study findings are critically needed to establish evidence-based practice standards to improve lifelong neuromotor capacity for >229,000 affected individuals in the U.S.

Role: MPI (Multiple Leadership Plan)

1UL1TR003015-01, K.C. Johnston & D.E. Brown (Multiple PI), 02/27/2019 – 01/31/2024, NCATS/NIH

The integrated Translational Health Research Institute of Virginia (iTHRIV): Using Data to Improve Health

iTHRIV is a collaboration of institutions across Virginia (University of Virginia, Virginia Tech/Carilion, Inova, Center for Open Science and License and Ventures Group) that brings team science, innovation, and commitment to train the next generation of clinical and translational researchers to a broad statewide community. iTHRIV will marry the expertise of our world class data science team with our outstanding clinical translational researchers to empower our researchers to use data centered approaches to uncover health care solutions.

Role: Co-Investigator

Completed Research Support

A Multisite Trial of ACQUIREc Therapy

Privately Funded

Role: PI

June 2008 – December 2011

T32 Training Program

Principal Investigator: Marcus Bamman, Ph.D.

Funded by: National Institutes of Health

Sept. 2012 – April 2017 (departed UAB Dec. 2012)

Interdisciplinary Training in Pathobiology and Rehabilitation Medicine

University Center for Exercise Medicine, University of Alabama at Birmingham

Role: Co-Investigator

Pediatric Constraint-Induced Movement Therapy in Low Income Countries

June 2012 – May 2013

Principal Investigator; Patty Coker-Bolt, O.T.D./L.

Funded by: The Medical University of South Carolina.

Role: Co-Investigator