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Understanding Recovery and Development in CHILDREN

with Early Brain Injury and Cerebral Palsy

ALINA GRIMALDO

Early interventions in children with cerebral palsy can be pivotal to improving motor and cognitive outcomes. The University of Wisconsin-Madison Pediatric Neuromodulation Laboratory (PNL), housed within the Waisman Center, is home to the National Institutes of Health-funded Baby Brain Recovery Study, the first of its kind. The focus of this study is to longitudinally assess, over the first two years of life, the recovery and development of the infant brain after early stroke or brain bleed.

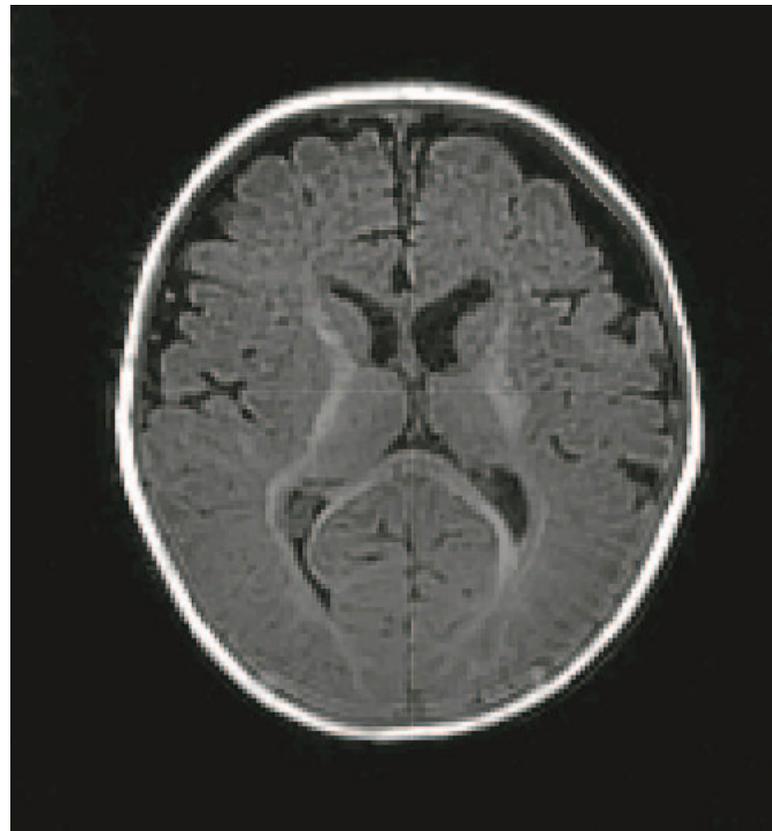
During the first year of my undergraduate career, I was eager to explore all the research opportunities UW-Madison had to offer. I was fortunate to have connected with Dr. Bernadette Gillick, an associate professor in the Department of Pediatrics for the School of Medicine and Public Health and the Director of the PNL. Her research focuses on neuroscience and neurorehabilitation, which was a great match for my interests as an aspiring physician.

Since joining the lab, I have learned that the way the brain functions is astonishing. It can reorganize itself by forming new neural connections in response to learning, interactions, or even after injury. We call this ability to change neuroplasticity. From our study, we hope to learn more about how the brain develops and changes after experiencing a stroke or a brain bleed around the

time of birth. Early brain injury is a primary cause of cerebral palsy, which is the most common motor disability in childhood.

Our lab uses three tools to assess development and neuroplasticity of an infant's brain after early injury: magnetic resonance imaging, behavioral and developmental assessments, and transcranial magnetic stimulation. Magnetic resonance imaging allows us to create an image of the brain and be able to analyze how the brain structures change at different ages post-injury. Our developmental assessments are performed by pediatric physical therapists to analyze developmental milestones, behavior, muscle tone, and reflexes. We use specific assessments that are age appropriate for the infants who participate in our study. Lastly, we use transcranial magnetic stimulation to assess brain connectivity and excitability. We do this through gentle magnetic pulses that activate motor pathways that connect the infant's brain and arm muscles. With this collective information, we can track the infant's brain and motor development over time, and this may help identify early predictors of motor outcomes or later cerebral palsy diagnosis.

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This image depicts the MRI scan of a typically developing infant brain taken at the Pediatric Neuromodulation Laboratory at the Waisman Center.

intervention that will have the greatest impact.

I maintain an active role as an undergraduate research assistant. I have been heavily involved in recruitment, data collection methodologies, refinement of study documents and processes, grant writing and working with our participant families. As part of my work this past summer,

I started the Multilingual Access Project within the PNL, reaching out to underrepresented communities and allowing them to learn more about our work and potentially participate in our study in their preferred language. Currently, we have translated our recruitment materials to Spanish, but we are working to expand this further. Additionally, I was



About the author

Alina Grimaldo, from Brookfield, WI, is pursuing a bachelor's degree in biochemistry and a certificate in French. She is an undergraduate research assistant in the Pediatric Neuromodulation Laboratory directed by Dr. Bernadette Gillick. Alina aspires to attend medical school to become a physician. She expects to graduate in May 2025.

awarded the Waisman Center's Intellectual and Development Disabilities Research Center Undergraduate Student Award. I am honored to be able to work with such a talented and dedicated multi-disciplinary team and I am grateful to them for graciously showing me the wonderful world of research.



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University of Wisconsin-Madison Pediatric Neuromodulation Laboratory's open house at the Waisman Center on 6/22/2022. The PNL team members presented to the Wisconsin Idea Seminar about shared experiences and research techniques. In attendance was Dr. Bernadette Gillick (first row, on right), Veronika Mak (right corner of frame), Rodrigo De La Torre (first row, second from left), Preston Christopher (first row, on left), Sally Jones (second row, on right), Marissa Galli (last row, on left), Alina Grimaldo (Back row, third from left), and other Wisconsin Idea seminar attendees.

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