

Auditory Neuroscience Laboratory

www.brainvolts.northwestern.edu

Discovering early markers of language development by studying brain activity, listening, and learning



Spring is here

Happy April! We're thrilled to have made it through the Chicago winter and see the sun coming out from behind the clouds. But we're even more thrilled to be well into year two of our study!



Since January we have welcomed our families back into the lab for their second year. It sounds like a cliché, but we really can't believe how much the Biotots have grown! We eagerly look forward to catching up with everybody throughout the year.

And we're still recruiting! So let your friends know about us. In the meantime, we hope you enjoy our Spring newsletter. New this month, we will tell you about some of the things our lab is up to in addition to Biotots. Enjoy!

--the Biotots team

A lot has happened in the lab lately!

- Nina Kraus, Robert Zatorre, and Dana L. Strait co-edited a special issue of *Hearing Research*, "Music: A window into the hearing brain" to bring together scientists studying music and hearing.
- Doctoral candidate Jennifer Krizman has received a prestigious National Research Service Award (NRSA) Predoctoral Fellowship from the National Institutes of Health!! This very competitive fellowship provides her two years' funding to collect data for her dissertation project.
- Our research on how early music training confers lifelong benefits for the nervous system was featured in a *Scientific American* podcast and in *National Geographic*.



Researcher Spotlight:



Ann Bradlow, Ph.D.

Professor, Project Investigator

Ann Bradlow, Ph.D., Professor and Chair of Linguistics at Northwestern University and director of the Speech Communication Research Group, has collaborated with the Auditory Neuroscience Laboratory for over a decade. Her current research areas focus on bilingualism, speech perception in noise, and understanding accented speech.

With the Auditory Neuroscience Lab, Dr. Bradlow contributes her expertise in speech perception, phonology, and auditory learning to our studies of the neural basis of speech perception. For Biotots, she contributes to study design and interpretation, ranging from the selection of study materials to data analysis, especially for our speech-based and perceptual study components.

Originally from South Africa, Dr. Bradlow lives in Chicago with her family.

We hope you had fun playing with us!

If you have any questions about the project or would like to share photos of your child with us, please call or email: (847) 491-2457 biototsresearch@gmail.com

Investigating the biological impact of community music programs

The Auditory Neuroscience Laboratory does more than study the pre-school brain! Starting this month we will feature a different project in our lab in each newsletter. First up is our Los Angeles-based project investigating the biological impact of community music instruction on the developing brain.

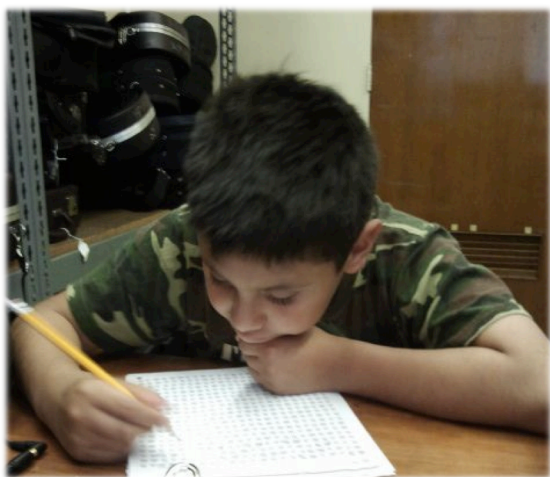


Our lab has spent years studying the biological impact of music instruction. By comparing musician and non-musician brains, we've discovered that music training has a profound influence on the nervous system—especially on language and cognitive skills. Musicians have more precise neural processing of sound, heightened auditory memory and attention, and are better at understanding speech in noisy environments.

Although we were convinced that music training has terrific potential to change the nervous system, we were bugged by two questions: (1) How many of the differences we see between musicians and non-musicians are due to training (“nurture”), and how many are due to innate differences in the brain that drove certain individuals to seek music instruction (“nature”)? (2) We'd only ever studied musicians with lifelong, formal instruction, such

as music majors and professionals. Would we see a similar biological impact with a community music program, suitable for widespread adoption across the country?

Enter Dr. Margaret Martin, founder of Harmony Project. For over fifteen years, Harmony has provided free music instruction to over 1000 children from Los Angeles gang-reduction zones. Once children enroll in elementary school, Harmony makes them a commitment: they receive free music instruction, instruments, and ensemble performance through high school, so long as they do well in school and practice their instruments.



It didn't take long for Dr. Martin to recognize that music instruction was having a profound influence on her kids. Suddenly they were finishing high school, going on to college, and making a positive impact in their families and communities. But as a non-profit, Harmony has to rely on donations and grants to continue their programming, and Dr. Martin soon found herself frustrated that she could only provide anecdotal evidence as to Harmony's efficacy. So she contacted Nina Kraus, our lab's principal investigator, and an unprecedented experiment began to take shape.

In June 2011, a team from our lab shipped off to LA, bringing a mobile lab in tow. They tested 80 elementary school kids

from Harmony's waiting list on a variety of biological, cognitive, and perceptual measures—all very similar to what we do with the Biotots! It wasn't easy, especially during the first year. We're used to testing in our carefully calibrated and controlled lab, not in classrooms. The team endured 14-hour days, 6 days a week, in stifling heat to work with all 80 kids. But the team pushed through and came back in July, slept for 10 days straight, and then got back to work.

Half of the kids were randomly selected to enroll in Harmony that year (the "experimental" group), and the other half were asked to wait a year (the "control" group). The team returned in June 2012 to repeat all the same tests. Then the control group enrolled in Harmony's classes for a year, and the experimental group continued music instruction. The team returned for the last session in June 2013. Taken together, this let us evaluate the biological impact of one year of music instruction *vs.* two years of music instruction *vs.* no music instruction.



What was the music training? We followed Harmony project's standard curriculum. All children start with an introductory musicianship class to learn about fundamental musical skills such as rhythm and composition. After gaining a basic understanding of music, the children begin instrumental classes that include private instruction and playing in ensembles.

Our study is the first longitudinal assessment of an existing community-based music program, combining both behavioral and biological measures to understand the impact of musical training on the developing brain. Our dataset is very complex, and our efforts to analyze all three years' data are ongoing. But preliminary findings indicate that music training indeed leads to improved language processing, observed behaviorally and biologically.

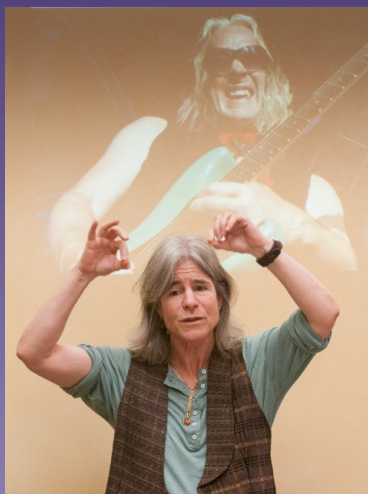
These findings are especially important and gratifying because these children come from underserved communities, and are at risk for learning problems and social difficulties as they continue through school. Many of the children in the Harmony Project say that Harmony helped them to achieve many things they would never have thought possible based on their environment. These children have expressed how this program has given them confidence in themselves and their abilities, an understanding of how to be better organized and manage their time well, and a desire to put more effort into doing well in school.

Our hope is that by demonstrating a tangible biological impact of community music instruction, our findings could lend support to the idea that music education can provide vital co-curricular enrichment to developing minds and brains. Stay tuned!

Moving? Have a new e-mail or phone number? Update your contact information with us by shooting an email to biototsresearch@gmail.com or calling us at (847)-491-2457.

We're looking forward to seeing you this year!

Recent news from the Auditory Neuroscience Laboratory



Rock musician Todd Rundgren, best known for his 1972 hit "Hello It's Me," visited the Auditory Neuroscience Lab for a lively discussion about how music shapes the brain and improves communication skills. Rundgren recently founded the Spirit of Harmony Foundation to promote music education in public schools.

"This research makes a strong case for music education from a scientific perspective," Rundgren said. "This data involving brain development adds compelling evidence to support the importance of bringing music to all students."



Photos by Max Levine

"What made the visit extraordinary was our easy interaction over signals. Todd understands the nuances of sound waves. So we were able to speak in considerable detail about how sound signals are transcribed by the nervous system into the electrical voltages which represent sounds in the brain." –Nina Kraus



KIDS AGES 5-18: Participate in a Family Language Study

Another research lab at Northwestern University is looking for families and individuals to participate in an NIH-funded research study to investigate the causes of autism. Currently, we are recruiting individuals to serve as controls in the study. You may be eligible to participate in this study if English is your native language and you do not have a family history of autism. The research study focuses on parents and children and involves a brief interview, telling stories while watching pictures on a monitor, and completing questionnaires. In addition to control families and individuals, we are also currently recruiting children and adults with autism spectrum disorders or fragile X syndrome and their family members. Participating in this research study offers a remarkable opportunity to help identify subtle behavioral features that may be markers of the genes involved in these developmental disabilities. Participants will receive up to \$50 each for completing the study, depending on the number of assessments administered. Parents will also receive a developmental report for each child. If you are interested in participating in the research study or want to learn more, please call us at **1-877-275-7187** or email familystudy@northwestern.edu. You can also read more about our projects at: familystudy.northwestern.edu.

We want to keep in touch!

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Thank you for your interest!

Molly Losh, Ph.D., The Neurodevelopmental Disabilities Laboratory

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